NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN ANALYSIS OF THE ACQUISITION PROCESS OF THE JOINT FIRES NETWORK/TACTICAL EXPLOITATION SYSTEM - NAVY

by

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June 2003

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** June 2003	**3. REPORT TYPE AND DATES COVERED** Master's Thesis

4. TITLE AND SUBTITLE An Analysis of the Acquisition Process of the Joint Fires Network/Tactical Exploitation System - Navy	**5. FUNDING NUMBERS**
6. AUTHOR (S) Patricia E. Leyland	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)	**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the U.S. Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited	**12b. DISTRIBUTION CODE**

13. ABSTRACT *(maximum 200 words)*

There is a growing movement throughout the Department of Defense (DoD) towards the implementation of Network Centric Warfare (NCW). In an effort to transition to NCW, the Navy has fielded many different technologies. One system exploiting new technologies in the Intelligence, Surveillance, and Reconnaissance (ISR) domain is the Joint Fires Network/Tactical Exploitation System-Navy (JFN/TES-N), which was developed from the Army Tactical Exploitation System, (TES-A).

This system was developed rapidly and uniquely for fleet deployment in accordance with the interim acquisition guidance signed by the Honorable Paul Wolfowitz. This guidance authorized Evolutionary Acquisition following a Spiral Development process in lieu of the "traditional" cold war process described in the DoD 5000 series publications. Assuming that (JFN/TES-N) will be viewed as a successful acquisition, several Navy personnel have stated that it may become the model for future C4I (and other) system acquisitions. This thesis seeks to help develop that model. The objectives of this thesis are:

- To examine whether the TES-N acquisition process is an appropriate model of Evolutionary Acquisition following a Spiral Development.
- To identify and make recommendations for changes or improvements to the TES-N acquisition program, so it can be used as a more appropriate model for Evolutionary Acquisition following a Spiral Development.

This thesis concludes that Evolutionary Acquisition following a Spiral Development shown with the JFN/TES-N system is an acquisition policy that is appropriate for programs of the same size and scope, but larger more complex programs will not have as much success. Yet, in order for the JFN/TES-N program and future programs using Evolutionary Acquisition following a Spiral Development to succeed, changes have to be made in policies such as budgetary submissions, test and evaluation, policy, process, and training.

14. SUBJECT TERMS Evolutionary Acquisition, Spiral Development, JFN/TES-N			**15. NUMBER OF PAGES** 93
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89) Prescribed by ANSI Std. 239-18

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AN ANALYSIS OF THE ACQUISITION PROCESS OF THE JOINT FIRES NETWORK/TACTICAL EXPLOITATION SYSTEM - NAVY

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN SYSTEMS TECHNOLOGY (JC4I)

from the

NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

There is a growing movement throughout the Department of Defense (DoD) towards the implementation of Network Centric Warfare (NCW). In an effort to transition to NCW, the Navy has fielded many different technologies. One system exploiting new technologies in the Intelligence, Surveillance, and Reconnaissance (ISR) domain is the Joint Fires Network/Tactical Exploitation System-Navy (JFN/TES-N), which was developed from the Army Tactical Exploitation System, (TES-A).

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ACKNOWLEDGEMENTS

I would like to recognize several individuals for their unique contributions to my research. First, I would like to thank IWS 6C and more specifically, CAPT Albert Thomas, Rich Lajoie, and Destiny Burns for their continuous assistance in explaining the JFN/TES-N program. I would also like to thank Dr. Stuart Starr for providing information on Evolutionary Acquisition following a Spiral Development and for putting me in contact with important people for necessary interviews.

My sincerest appreciation and respect go to my advisor, Professor William Kemple. In addition to providing me a solid background on the history of the JFN/TES-N program, he continually gave me guidance on how to collect research data and then technically write my results in a way that is clear for the reader. I would also like to thank Professor Susan Hutchins for taking the time to show me how to develop and analyze a survey. Next, I would like to thank Professor Keith Snider for his support as an associate advisor of my thesis. I would also like to thank Professor Chuck Marashian for helping me over little stumbling blocks I encountered while collecting data for my thesis.

Next, I would like to thank LCDR Matt Hopson for his constant support in obtaining thesis research from the fleet. Without him I would have never been able to acquire the fleet perspective on JFN/TES-N.

I would like to thank all the people who I interviewed in regards to this thesis to include, VADM (RET) Ted Parker, CAPT Christopher Bott, CAPT Paul Hill, CAPT Albert Thomas, CDR Victor Olivarez, LCDR Matt Hopson, Rich Lajoie, David Loneman, and the decision makers and operators of the JFN/TES-N aboard the USS CORONADO.

Finally, I would like to thank Nancy Sharrock for all her editing help.

EXECUTIVE SUMMARY

There is a growing movement throughout the Department of Defense (DoD) towards the implementation of Network Centric Warfare (NCW). In an effort to transition to NCW, the Navy has fielded many different technologies. One system exploiting new technologies in the Intelligence, Surveillance, and Reconnaissance (ISR) domain is the Joint Fires Network/Tactical Exploitation System-Navy (JFN/TES-N), which was developed from the Army Tactical Exploitation System, (TES-A).

This thesis explains that JFN/TES-N was developed rapidly and uniquely for fleet deployment in accordance with the interim acquisition guidance signed by the Honorable Paul Wolfowitz. This guidance authorized Evolutionary Acquisition following a Spiral Development process in lieu of the "traditional" cold war process described in the DoD 5000 series publications. Assuming that JFN/TES-N will be viewed as a successful acquisition, several Navy personnel have stated that it may become the model for future C4I (and other) system acquisitions. This thesis seeks to help develop that model. The objectives of this thesis are:

- To examine whether the TES-N acquisition process is an appropriate model of Evolutionary Acquisition following a Spiral Development.
- To identify and make recommendations for changes or improvements to the TES-N acquisition program, so it can be use as a more appropriate model for Evolutionary Acquisition following a Spiral Development.

In order to examine the TES-N acquisition process as a model for future system acquisitions, and make recommendations for changes to it if appropriate, this thesis reports the results of a literature search to explicitly determine the characteristics of each of these documented processes. Next, this thesis extracts the salient characteristics of the TES-N acquisition process through interviews with key personnel at the TES-N program office. Next, this thesis use the breakdown of Evolutionary Acquisition following a Spiral Development in the article, *The Promise and Perils of Spiral Acquisition: A Practical Approach to Evolutionary Acquisition* by COL Wayne M. Johnson, USAF (Ret) and Carl O. Johnson as a model for Evolutionary Acquisition following a Spiral Development and the DoD 5000 series documents as a model for the “traditional” acquisition policy, to reveal key points that highlight relative differences between the two as a basis for characterizing the JFN/TES-N acquisition process. Next, the results of surveying fleet personnel show the user’s opinion on the new system’s performance. Finally, this thesis reports the results of interviews of operators and decision makers aboard the USS CORONADO, flagship of Commander Third Fleet (C3F) and makes recommendations based upon my findings for future programs with an acquisition process similar to Evolutionary Acquisition following a Spiral Development.

This thesis concludes that Evolutionary Acquisition following a Spiral Development shown with the JFN/TES-N system is an acquisition policy that is appropriate for programs of the same size and scope, but larger more complex programs will not have as much success. Yet, in

order for the JFN/TES-N program and future programs using Evolutionary Acquisition following a Spiral Development to succeed, changes have to be made in policies such as budgetary submissions, test and evaluation, policy, process, and training.

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I. INTRODUCTION

A. BACKGROUND

There is a growing movement throughout the Department of Defense (DoD) towards the implementation of Network Centric Warfare (NCW). In efforts to transition to NCW, the Navy has fielded many different systems and technologies. One such system exploiting new technologies in the Intelligence, Surveillance, and Reconnaissance (ISR) domain is the Joint Fires Network/Tactical Exploitation System-Navy (JFN/TES-N), which was developed from the Army's Tactical Exploitation System, (TES-A).

This system was developed rapidly and uniquely for fleet deployment in accordance with the interim acquisition guidance signed by the Honorable Paul Wolfowitz. This guidance authorized Evolutionary Acquisition following a Spiral Development process in lieu of the "traditional" cold war process described in the DoD 5000 series publications. Assuming that JFN/TES-N will be viewed as a successful acquisition, several Navy personnel have stated that it may become the model for future C4I (and other) system acquisitions. This thesis seeks to help develop that model.

B. OBJECTIVE

The objectives of this thesis are two-fold:

- To examine whether the TES-N acquisition process is an appropriate model of Evolutionary Acquisition following a Spiral Development.

- To identify and make recommendations for changes or improvements to the TES-N acquisition program, so it can be use as a more appropriate model for Evolutionary Acquisition following a Spiral Development.

C. SCOPE AND METHODOLOGY

1. Scope

This thesis examined the JFN/TES-N acquisition process to determine whether this process should be followed as is, modified, or abandoned in future acquisitions. Based on this analysis, I made recommendations on what should be retained as future doctrine and what needed to be fixed. I also examined any problems and recommended solutions.

2. Methodology

Within DoD today, there are two different documented development and acquisition processes: the traditional process documented in the DoD 5000 series and the newer Evolutionary Acquisition following a Spiral Development process described in the October 30, 2002 memorandum signed by the Deputy Secretary of Defense, the Honorable Paul Wolfowitz.

In order to assess the suitability of the TES-N acquisition process as a model for future system acquisitions, and make recommendations for changes to it if appropriate, I conducted a literature search to explicitly determine the characteristics of each of these documented processes. Next, I determined the salient characteristics of the TES-N acquisition process through interviews with key personnel at the TES-N program office. Next, I used the breakdown of Evolutionary Acquisition following a Spiral Development in the article, *The Promise and Perils of*

Spiral Acquisition: A Practical Approach to Evolutionary Acquisition by COL Wayne M. Johnson, USAF (Ret) and Carl O. Johnson as a model for Evolutionary Acquisition following a Spiral Development and the DoD 5000 series documents, specifically DODI 5000.2 Operation of the Defense Acquisition System (Including Change 1 4JAN2001), as a model for the "traditional" acquisition policy, to reveal key points that highlight relative differences between the two as a basis for characterizing the JFN/TES-N acquisition process. I then surveyed fleet personnel to determine their opinion on the new system's performance. Finally, I interviewed operators and decision makers aboard the USS CORONADO, the flagship of Commander Third Fleet (C3F) and make recommendations based upon my findings for future programs with an acquisition process similar to Evolutionary Acquisition following a Spiral Development.

D. RESEARCH QUESTIONS

- What acquisition process is being used for the JFN/TES-N?
- What is the "traditional" acquisition process described by the 5000 series publications?
- What is Evolutionary Acquisition following a Spiral Development?
- How does the JFN/TES-N acquisition process compare to the "traditional" cold war philosophy described in the 5000 series publications and the new process of Evolutionary Acquisition following a Spiral Development?
- What recommendations can be made to improve the Evolutionary Acquisition following a Spiral Development process based on the TES-N model?

E. ORGANIZATION OF THE THESIS

Chapter II provides the role, history, and background of TES-N, starting with how it first was developed by the Army, and then was adopted by the Navy.

Chapter III provides a definition and description of the "traditional" acquisition process as described in the DoD 5000 series publications.

Chapter IV defines Evolutionary Acquisition following a Spiral Development. A breakdown of Evolutionary Acquisition following a Spiral Development is described by COL Wayne M. Johnson, USAF (Ret) and Carl O. Johnson, article, *The Promise and Perils of Spiral Acquisition: A Practical Approach to Evolutionary Acquisition*.

Chapter V begins by further explaining why the United States needs to change their acquisition process in order to provide timely technology and intelligence to the war fighter. Next, it explains the JFN/TES-N Evolutionary Acquisition following a Spiral Development. This chapter then uses the breakdown of spiral development in the Johnson and Johnson article, as a model for Evolutionary Acquisition following a Spiral Development and the DoD 5000 series documents as a model for the "traditional" acquisition policy, to reveal key points that highlight relative differences between the two as a basis for characterizing the JFN/TES-N acquisition process.

Chapter VI provides conclusions and recommendations on what can be improved and what should be used in future acquisition programs such as the TES-N.

II. HISTORY OF THE TACTICAL EXPLOITATION SYSTEM

The goal of this chapter is to provide the reader background on the role of the TES in its military environment. It also provides a history of the TES-N, starting with how TES first was developed by the Army and then adopted by the Navy. It will further present a background of the TES-N architecture and a description of how TES-N operates in its environment.

A. BACKGROUND

In 1973, the Army created the Army Space Program Office (ASPO), whose role was “developing systems to integrate current and emerging national capabilities into the decision-making process, a kind of networked information system.” (Littman, 2002, p. 6) Since that time, other programs have developed similar offices known as Tactical Exploitation of National Capabilities (TENCAP). In 1995, the ASPO decided to build a system called the Tactical Exploitation System (TES)(for simplicity in the thesis, the Army program will be called TES-A) that would consolidate intelligence such as national and theater imagery systems into one Multi-Intelligence system. It would be a scaled down version of a few existing TENCAP systems. These TENCAP systems to be replaced by TES-A were the Modernized Imagery Exploitation system (MIES), Advanced Electronic Processing and Dissemination System (EPDS), and the Enhanced Tactical Radar Correlator (ETRAC). The TES-A alone would provide the functional capability of all three systems. (Littman, 2002, p. 38)

The eventual commercial developer of the TES-A, Northrop Grumman (NG), stated that they were to deliver a system, which was:

> Assured receipt of all-weather, day/night intelligence, surveillance, reconnaissance (ISR) information from national, theater and tactical platforms…through all phases of military operations, providing a real-time, correlated imagery and SIGINT picture directly to the tactical warfighter. (Littman, 2002, p. 38)

The Army developed the TES-A as a dual-base system consisting of a TES Main (TES-M) and a TES Forward (TES-F). "The main element (TES-M) remains in relatively secure locations and provides detailed intelligence analysis and support to the forward element (TES-F)." (Littman, 2002, p. 7) TES-F, unlike TES-M, is brought into forward areas and operated on the battlefield. The maneuverability of TES-F can be seen in Figure 1 below.

Figure 1. TES-Forward, Notice How the System Can Be Mounted and Easily Transported on Light Trucks and HMMWV's (From: Littman, 2002, p. 39).

In 1997, the Navy began to see the potential benefits of adopting the TES-A to address land attack targeting from surface ships. They initially wanted this particular ISR system for three reasons: to leap ahead in technology, to lead to interoperability and software sharing, and to form a long-term relationship with the Army. (Lajoie, Interview, 2003 and Read Ahead for NFN)

Around this time, the Chief of Naval Reserves and Chief of Naval Operations N6B received permission to purchase a copy of the TES-A and to adapt it into what the Navy called the Littoral Surveillance System (LSS). (Read Ahead for NFN) This first variant of TES-A, the LSS, was made up of TES-F and a Mobile Inshore Undersea Warfare System Upgrade (MIUW-SU). According to Littman:

> MIUW-SU consists of a Radar Sonar Surveillance Center (RSSC) van, which is used as a command center and an array of sensors. The sensors include radar for aircraft detection and sonobuoy processing for underwater target detection. This was to provide complete littoral area surveillance. (Littman, 2002, p. 7)

During 1998 through 2000, the LSS was built and tested in Fleet Battle Experiment-Echo (FBE-E). (Littman, 2002, p. 7)

Later, Navy variants of the TES-A called the TES-N, Remote Terminal Components (RTC) and Remote Terminal Components Lite, were developed and deployed by the Navy. Each variant is different, and used for different levels of activity. Figure 2 depicts the three variants of TES-N used today.

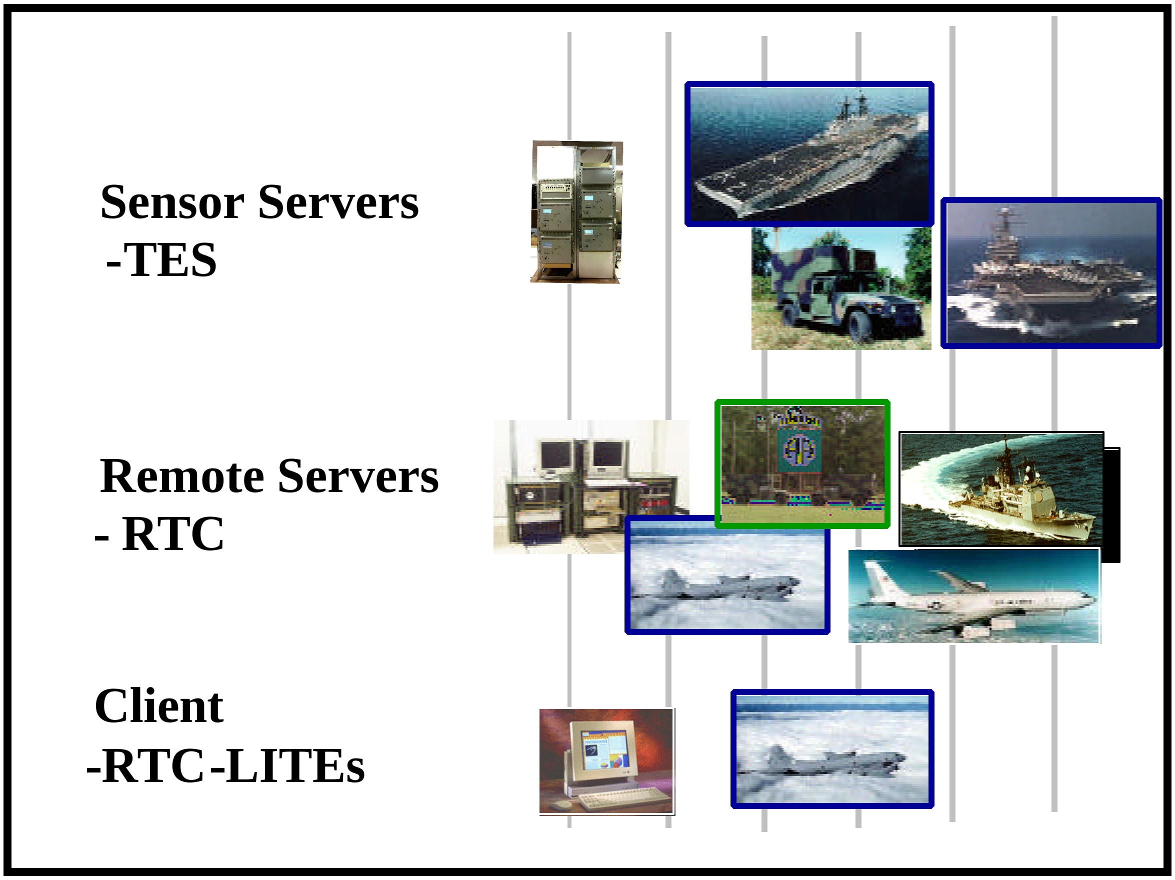

Figure 2. The TES-N, RTC, and RTC-Lite (From: Thomas, Joint Fires Network Overview, January 2003).

The Navy's vision, of TES-N, is part of a system of systems providing an end-to-end architecture for Time Sensitive Targeting (TCT). However, the TES-N is only one component of the system of systems. The others are currently JSIPS-N, GCCS-M and an undetermined fire management system generically referred to as Integrative Cooperative Engagement (ICE). (Lajoie, Interview, 2003) In naming the TES-N, RADM Mullen (now VADM selected to ADM), as N76, coined the TES-N as Naval Fires Network (NFN)/TES-N as he was preparing his Congressional briefings. This later was renamed Joint Fires Network (JFN)/TES-N. (Burns, 2003)

The TES-N is a complete system, and is equipped with sensor servers which allow direct connectivity to the sensor. The RTC has remote servers which cannot talk directly to the sensors. They must receive the sensor information via a full TES or some other intermediary, but possess full processing capability. The RTC-Lites are basically laptops/clients that are only used for visual display of information in the fleet. (Lajoie, Interview, 2003) Figure 3 is a closer view of the Remote Terminal Component aboard the USS Coronado.

Figure 3. Remote Terminal Component. (From: Littman, 2002, p. 52).

At this time, the Navy realized that they were deficient in the TCT of NCW. Therefore, a key mission capability that the Navy was trying to achieve using TES-N was TCT. Through Fleet Battle Experiments (FBE) and Limited Objective Experiments (LOE), the program office IWS 6C wanted to ensure that the TES-N provided the capability to do “Time Critical Targeting against rapidly relocateable targets.” (NFN Read Ahead for N76) The goal of the TES-N

was to be able “… to correlate multiple off ship sensors’ data and intelligence with information from the tactical, theater, and national levels.” (Littman, 2002, p. 41) In the end, JFN/TES-N would be able to collect data from the sources of intelligence listed below with the ability for Cross-Intelligence application and nodal analysis.

- SIGINT
    - National data
    - Real-time interface
    - Theater SIGINT
    - Modified GALE
    - Real-time sensor control / tasking
    - Combat assessment
- Imagery
    - National imagery
    - Direct Down Link (DDL) theater imagery
    - COTS package for exploitation
    - Real-time sensor control/tasking
    - Accurate geo-location
- MTI
    - Multiple Theater feeds (e.g. Global Hawk)
    - Auto track and correlation
    - Cross-cue/overlay (Thomas, Joint Fires Network Overview, 2003)

Figure 4 shows how this would work.

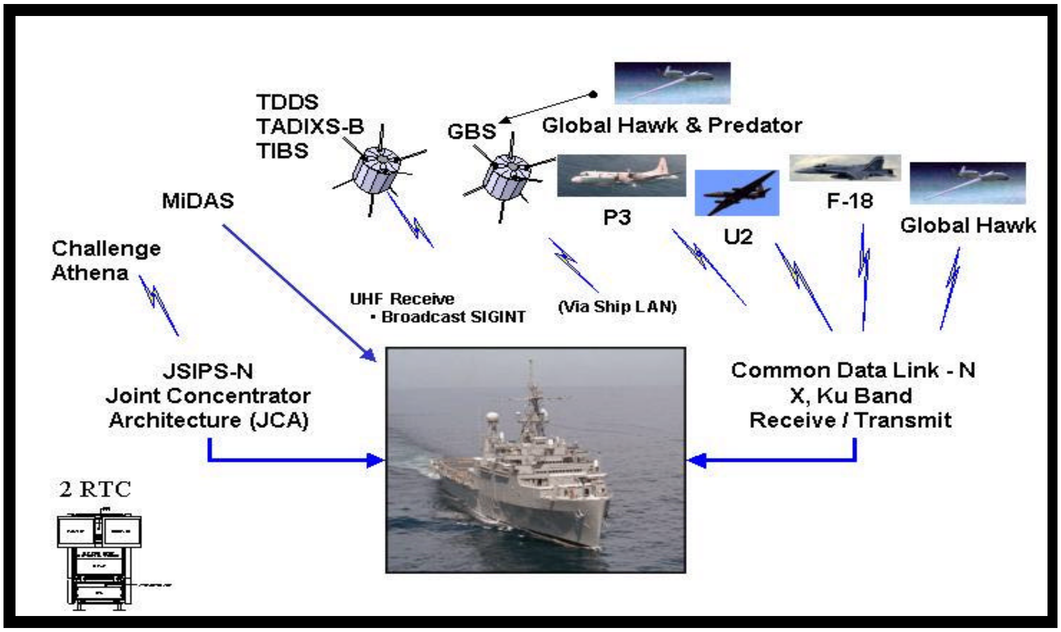

Figure 4. TES-N Sensor Inputs (From: Littman, 2002, p. 42).

Throughout the TES-N development and fielding, Commander 3rd Fleet (C3F) was an early sponsor and made an active part of the TES-N lifecycle. C3F continually monitored the productivity and functionality of the system. Later, Third Fleet helped to conduct FBE and LOE to improve TES-N because they realized it would help with operations such as land attack and force protection in the fleet. (Thomas, Interview, 2003)

In 2001, the TES-N was delivered to the USS Coronado. Installing it on a ship brought operational insight to the system engineers developing TES-N. Due to the infrastructure of the ship, they could install the TES-N without the infrastructure that the Army had used with TES-A. Next, when the TES-N became operable on ships, the Navy started to test the system through a series of LOE.

Around this same timeframe, all systems of the TES (meaning all variants of TES-A and TES-N) were being built with an open and common architecture. The open architecture of TES entails a common standard where no proprietary hardware was used. It was all either government owned or commercial, and computer components were required to be commercial off the shelf. This was done so that it would take less money to change components in the future. The common architecture of the TES also means that all services use a common software version, which was intended to mean that there was a core version, and if one service needed a new entity for the core, then they were entitled to build it to fit the core while still making it readily available to other services if they wanted its capability. (Lajoie, Interview, 2003) In addition each service was funding its individual requirements, but all services got to benefit from the new capabilities added to the core. So far, this cost sharing arrangement and joint configuration management has proven to be very beneficial. (Burns, 2003) Therefore, two rules were that no service could change the core and no service could make a unilateral change if it affected the core or hurt another service.

Also around this time, the United States Air Force (USAF) and United States Marine Corps (USMC) began to acquire variants of the TES. The USMC referred to it as the Tactical Exploitation Group (TEG) and the USAF referred to it as the Intelligence, Surveillance and Reconnaissance-Manager (ISR-M). The Marine Corps, like the Air Force, realized that the interoperability of the system was a great idea because they would benefit from the sharing of targets and ISR. The Marine Corps also realized that to

obtain this capability, they only had to evaluate and update their system called, TEG. (Lajoie, Interview, 2003) Even though, TEG and ISR-M have the same functionality as a full TES-N or TES-A due to their common software baseline, each service can chose doctrinally to use the system to meet their specific service requirements and may or may not take advantage of all the inherent tools and capabilities. The common software, however, allows sharing of raw and processed sensor data, targeting information, and other ISR and Intelligence Preparation of the Battlefield (IPB) collaboration. (Burns, 2003)

Fortunately, the Army in 1999 had also made a “virtual program office” for the development of the TES that included all the services called the Joint Commonality Board (JCB). (Lajoie, Interview, 2003) The Joint Commonality Board is a virtual program office that acts like one chain of command, but in reality, it does not function that way. Ideally, all the services meet with their user requirements and vet out which requirements are going to be developed. Yet, each service is answering to their respective chain of commands and making sure that their services requirements are also being met. From the beginning, all services were on board but only the Navy and Army were contributing money. (Lajoie, Interview, 2003) Since the TES-N is constructed with a common architecture, the program office is currently working on Version 6.0 of the software and has fielded some of these TES systems seen below in Figure 5.

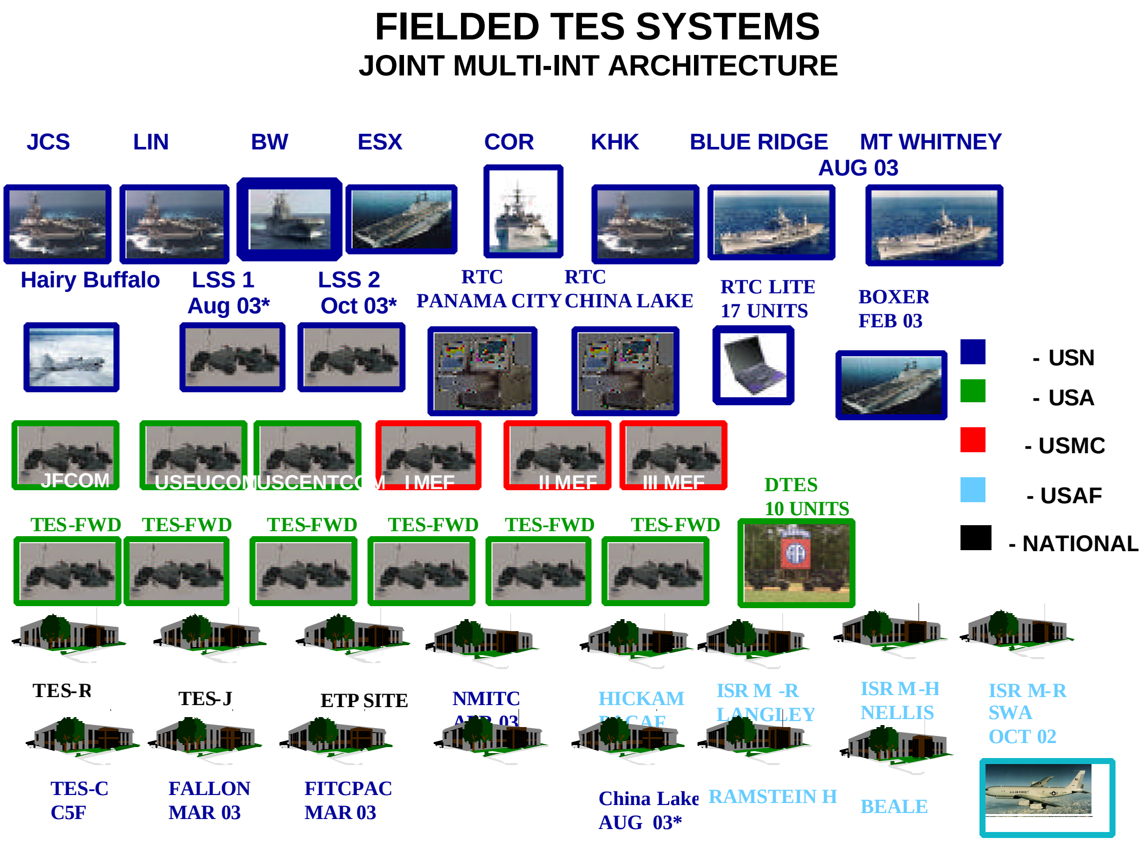

Figure 5. Fielded TES Systems (From: Thomas, Joint Fires Network Overview, January 2003).

As for its hardware technology, since Moore's law states that the computing power of a computer will double every 18 months, the TES-N will continue to be updated each year to keep up with hardware changes. The TES-N will also be updated to changes in user's needs. Below is a figure of what the TES-N program office (IWS 6C) hopes to accomplish in 2003. This list is more specific to the Navy's needs but there are also requirements that the Army, USMC, and USAF hope to accomplish.

PMS 454 P3I activity in 2003

• AMSTE II Integration	Fire Control & Weapon Quality MTI
• JTAAC integration	Adaptation of AADC Functionality for Land Attack
• ADOCS/AFATDS Integration	Engagement Grid Interface
• Tactical Control System	Integration of Common UAV Control System
• NCCT Integration	Airborne Sensor Networking (EP-3, EA-6B, RJ, etc.)
• SIGINT Targeting	Fire Control/Weapon Quality SIGINT Geo-location
• CADP Development	X, Ku Phased Array Antenna Development
• Classified Sensor Integration	Classified (2 Different Sensors)
• RTC Lite Development	Windows based TES data access and Display
• Tactical Dissemination Module	Move Aircraft uplink from LOS to Link 16 to IP
• Improved Networking	Improve TES Networking & DB replication
• Force Protection Package	Integration of Force Protection Sensors

Figure 6. PMS 454 P3I Activity in 2003 (From: Thomas, Joint Fires Network Overview, January 2003).

B. THE SIX LAYER PICTURE OF THE TES-N

In order to understand the composite picture of the TES-N, one must understand the TES-N's six-layer picture.

> TES-N creates a composite picture for the tactical war fighter by stacking all of its inputted data in a logical way. Essentially, six different layers make up the composite picture This stack…is built by combining the data from the many sources including: electronic maps/charts, tactical and national imagery (IMINT), Moving Target Indicator (MTI) and track data from airborne sensors, signals intelligence (SIGINT) both from the Miniaturized Data Acquisition System (MIDAS) and from the global broadcast system (GBS), graphical data, and imagery interpretation reports (IIR). TES-N can then display the composite data in various ways

that can support the myriad missions today's warfighters find themselves in. (Littman, 2002, p. 40)

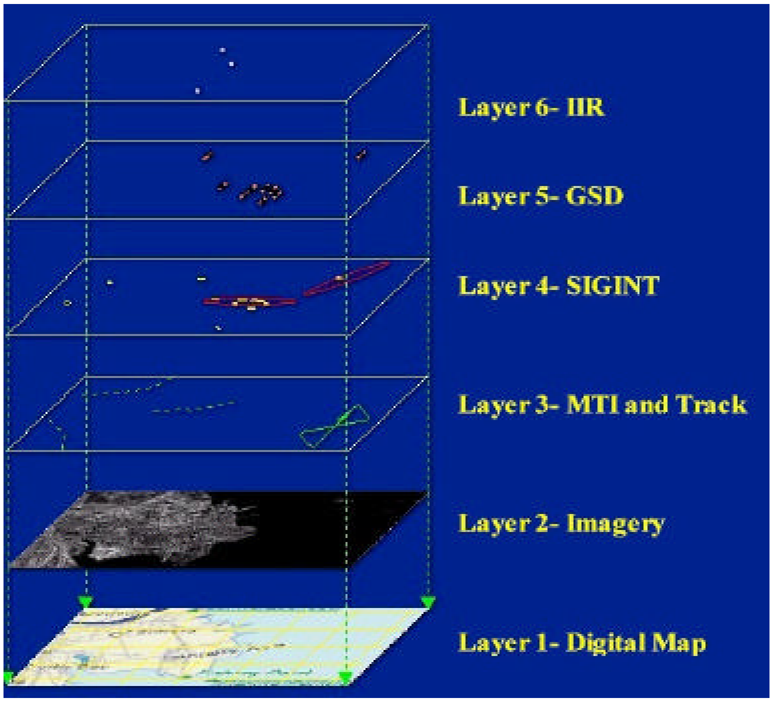

Figure 7. Stacked Information Layers (From: Littman, 2002, p. 43).

The TES-N architecture is made up of six layers, each possessing different functions. More specifically, the first or base layer is composed of maps so that the system can obtain latitudes and longitudes for its targets and intelligence data. The digital maps, which can be updated as needed, are taken from the National Imagery and Mapping Agency (NIMA). Layer 2 is made up of tactical and national imagery. Tactical imagery comes from numerous air and ground sensors such as F-18's and UAV's. Layer 3 …"is composed of Moving Target Indicator (MTI) and other track data sent to TES-N from a [capable] aircraft." (Littman, 2002, p. 48, The word capable is not in the quote) The

fourth layer receives signals intelligence from sources such as National SIGINT, SCI level SIGINT, and SIGINT from the Miniaturized Data Acquisition System (MIDAS). The fifth layer is made up of the Graphical Situation Display (GSD), which helps improve the asset organization and the commander’s situational awareness. The sixth layer’s Imagery Interpretation Reports (IIR) further improves the commander’s situational awareness and asset organization. “All six of the layers’ functionalities can be toggled on or off by the operators to produce the most relevant picture for a given situation.” (Littman, 2002, p. 50) Finally, to locate information, an operator has flexibility within each layer by being able to scale in or out for the data required.

C. HOW THE JFN/TES-N WORKS

The JFN/TES-N is a joint end-to-end architecture for Time Sensitive Targeting. The system merges the capabilities from ISR, targeting, mission planning, and situational awareness in order to strike an accurate target. As seen in Figure 8 below, the TES-N first detects, collects and displays the data from sensors and data links in real time. This data is then exploited using its intelligence subsystems so that commanders can make real time, accurate decisions about targets. These targets are assigned to different weapons systems so that they can be attacked. (Blackledge, 2002, p. 5)

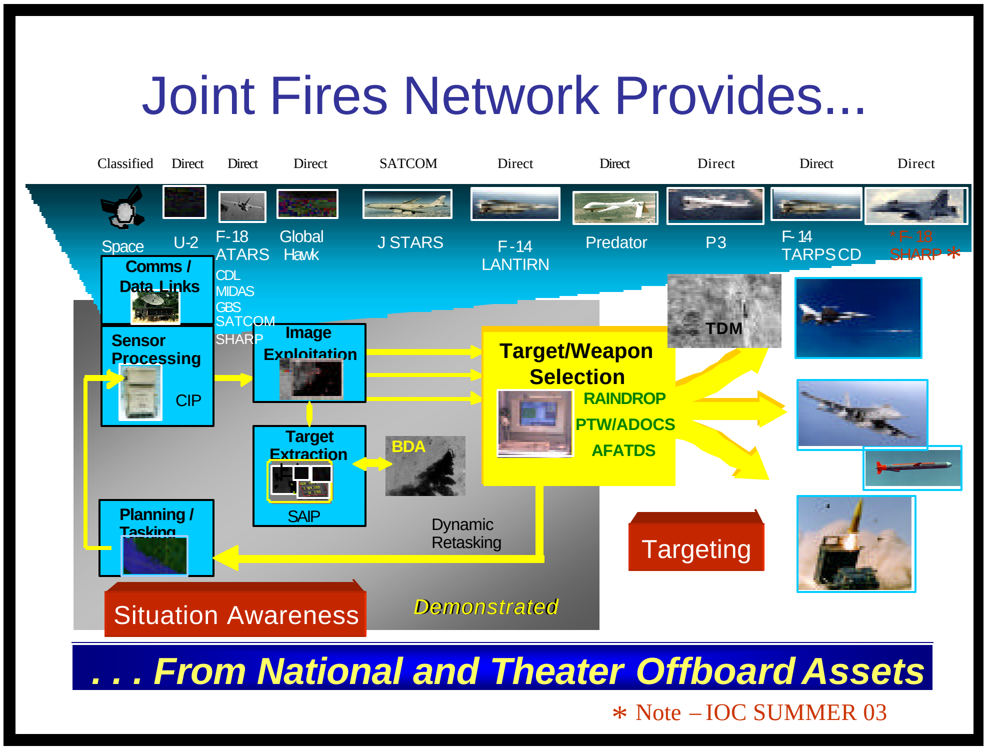

Figure 8. A Picture of What JFN Provides to the User (From: Thomas, Joint Fires Network Overview, 2003).

III. THE TRADITIONAL (AS DESCRIBED BY THE 5000 SERIES PUBLICATIONS) APPROACH TO ACQUISITION

This chapter provides the reader with an understanding of the acquisition process and policy that has been developed over the past fifty plus years. Readers need to understand the old process to better understand the changes and why these changes are being made.

Since before the cold war, DoD’s systems acquisition has been following a policy that prescribes a phased process for developing a system. This process follows a path of finishing one activity, obtaining approval and then proceeding to the next activity. Each year the DoD also has an established way of submitting a budget so that they can allocate obligation authority to each program accordingly. Furthermore, there is a policy for conducting tests and evaluations for programs. The phased process is a formal and organized way of acquiring systems, which has been used, evolved, and tailored for over fifty years, but due to rapidly changing technology, many believe that this acquisition policy is performed in an inefficient way that produces outdated results. Some key points I hope to highlight in this chapter are that the “traditional” process is accomplished in phases and milestones, it must have an Operational Requirements Document (ORD) and Mission Needs Statement (MNS), and policies such as budgetary submissions and test and evaluation are developed according to this old policy.

A. THE DODI 5000.2 ACQUISITION PROCESS

According to DoDI 5000.2, Operation of the Defense Acquisition System, an acquisition program is:

> A directed, funded effort designed to provide a new, improved, or continuing materiel, weapon, or information system or service capability in response to a validated operational or business need. Acquisition programs are divided into different categories that are established to facilitate decentralized decision-making, execution, and compliance with statutory requirements. Technology projects are not acquisition programs. (Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System, Enclosure E2.1.2)

The Defense Acquisition System consists of a series of phases and control gates which control the development of a new program by balancing the risks and benefits while controlling the costs of that system. DoDI 5000.2 establishes the Defense Acquisition System as a process, which translates a user's Mission Needs Statement and business requirements, and the latest technology capabilities into a system that is useful for the user. A model of a defense acquisition management program is shown below. It is broken down into three activities called Pre-Systems Acquisition, Systems Acquisition, and Sustainment.

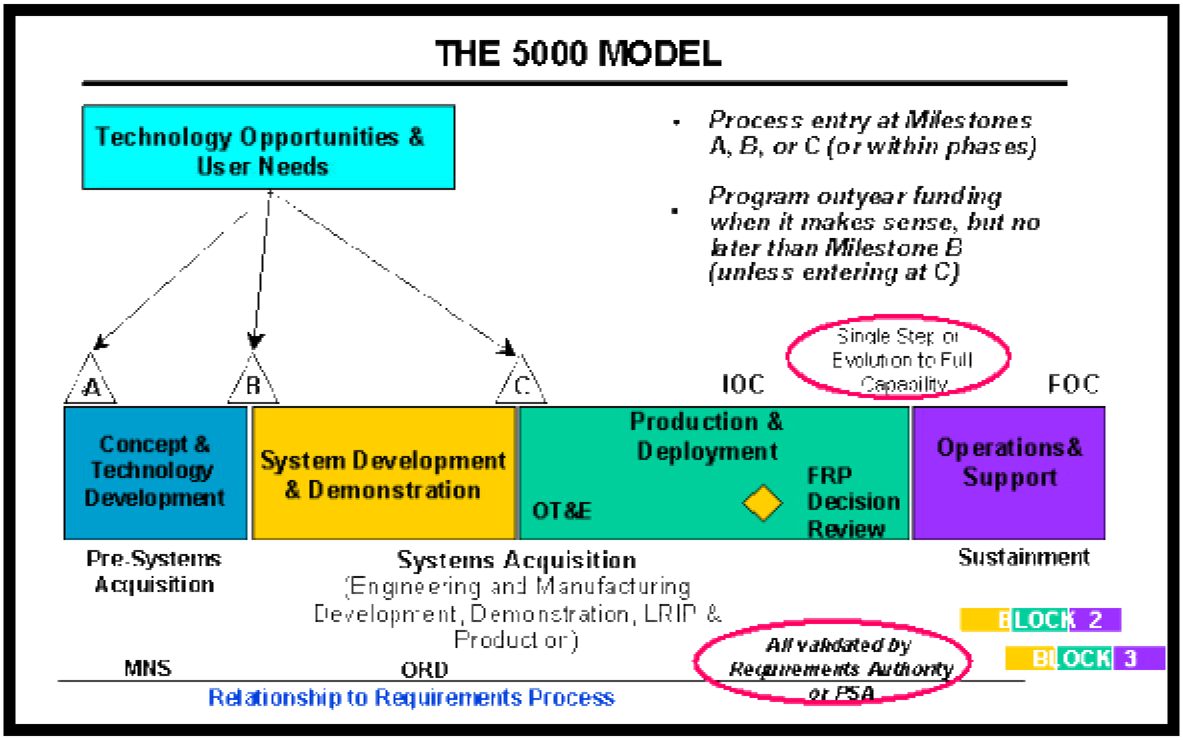

Figure 9. The 5000 Model (From: Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System).

These three activities are then further divided into four more phases, the first and third activity having one phase and the second activity having two phases. For example, the first phase is Concept and Technology Development. Next, each phase is divided into the specific work efforts achieved in that phase. For example, the work efforts in the Concept and Technology Development phase are Concept Exploration and Component Advanced Development. These are described below. Each phase also has entrance and exit criteria, which establish whether the project is ready to enter or exit its future or existing phase respectively. Entrance criteria for a phase are the minimum accomplishments that must be completed by a program before it is allowed to enter the next phase. Similarly, exit

criteria are defined as program specific results that must be reached by the end of the phase. In addition, there are three important milestones in the overall process. The program office must ensure that there is an approved MNS in order to start the program at Milestone A, which happens before Concept Exploration. To pass Milestone B, which occurs right before Systems Integration, they must ensure they have an approved ORD. In order to proceed past Milestone C, which is right before the work effort known as Low-Rate Initial Production, the system must be approved for low rate initial production by the correct approving authority.

B. THE DESCRIPTION OF THE DODI 5000.2 MODEL

During the Pre-Systems Acquisition action, which is also known as the Concept and Technology phase, the key objectives are to ascertain user requirements and the technological opportunities that are available for the new system. This phase is divided into work efforts called Concept Exploration and Component Advanced Development (as seen below).

In the Concept Exploration stage, the program office conducts paper studies of alternative concepts for meeting the user requirements listed in the MNS. The exit criterion for Concept Exploration is that the program office realizes that they have a specific concept that can be developed with existing technology. The program office enters the Component Advanced Development stage to start the system's architecture once they are sure the concept is sound. In this stage, the engineers continually study concepts that might be helpful to further technological advancement of

this system. In order for the program to proceed to the next phase, it is necessary to demonstrate that the system architecture and technology of the system are in their relevant environments as described by the MNS.

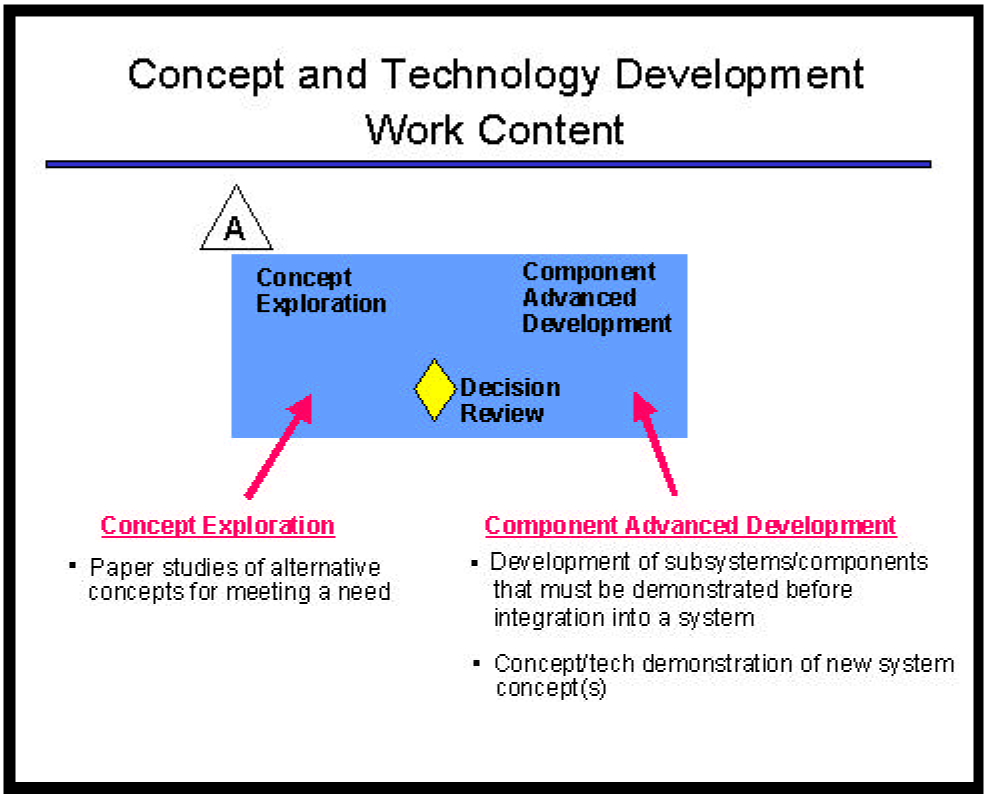

Figure 10. Concept and Technology Development Work Content (From: Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System).

The next activity is the Systems Acquisition Activity, which occurs across both the System Development and Demonstration Phase and the Production and Deployment Phase. DoDI 5000.2, Operation of the Defense Acquisition System, states that:

> The purpose of the System Development and Demonstration phase is to develop a system, reduce program risk, ensure operational

supportability, design for producibility, ensure affordability, ensure protection of Critical Program Information, and demonstrate system integration, interoperability, and utility. Discovery and development are aided by the use of simulation-based acquisition and test and evaluation and guided by a system acquisition strategy and test and evaluation master plan (TEMP). System modeling, simulation, test, and evaluation activities shall be integrated into an efficient continuum planned and executed by a test and evaluation integrated product team (T&E IPT). (Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System, 4.7.3.2.1.1)

The System Development and Demonstration Phase is divided into two system work efforts: Systems Integration and Systems Demonstration (as seen below).

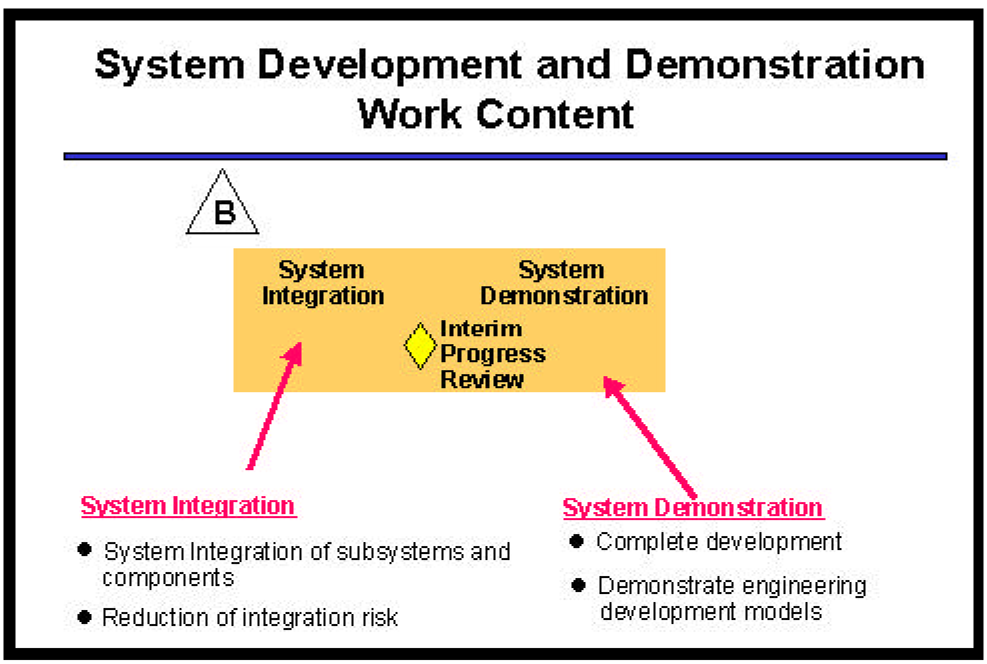

Figure 11. System Development and Demonstration Work Content (From: Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System).

In Systems Integration, the program office concentrates on the integration of subsystems and the cutback of integration risk. In order to enter into Systems Demonstration, the prototypes developed in System Integration must be functioning in a relevant environment. During Systems Demonstration, the systems engineers and contractors complete development, demonstrate engineering development models, and conduct combined developmental and operational testing. The program may exit this phase and enter the Production and Deployment activity only after sufficient testing and a successful system demonstration in its intended environment.

In the Production and Deployment Phase, the program office hopes to establish an operational capability that was requested earlier through the MNS. This phase is also further divided into two parts: Low-Rate Initial Production and Full-Rate Production and Deployment (as seen below).

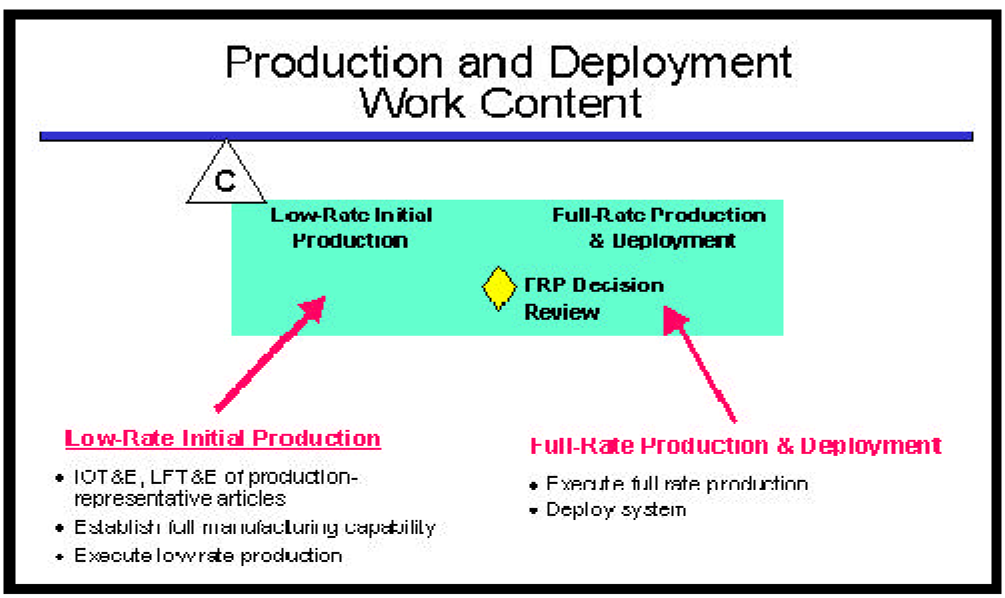

Figure 12. Production and Deployment Work Content (From: Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System).

In order for a program to start Low-Rate Initial Production, the program must obtain approval from the Milestone Decision Authority (MDA) (discussed below). This will ensure that the program office has completed a list of requirements such as an approved ORD, acceptable interoperability, suitable operational supportability, demonstration that the system is affordable throughout the life cycle, adequate information assurance to include information assurance detection and recovery, and up to standard anti-tamper provisions. During Low-Rate Initial Production, not only is the system going through low-rate production, but it also has a set of tests that it must pass, such as initial operational test and evaluation (IOT&E) and live fire test and evaluation (LFT&E). It also must be established whether the system is ready for full-rate production (FRP). Once the system has been deemed operationally effective by the Operational Test and Evaluation Force (OPTEVFOR) and ready for full-rate production, it is then allowed to enter the Full-Rate Production and Deployment stage. In order to exit this activity, the system must have full operational capability and the deployment must be complete.

Finally, the purpose of the last activity, entitled Sustainment, is to provide affordable support of the system throughout its life cycle. This activity is called the Operations and Support Phase and is also divided into two parts: Sustainment and Disposal (as seen below).

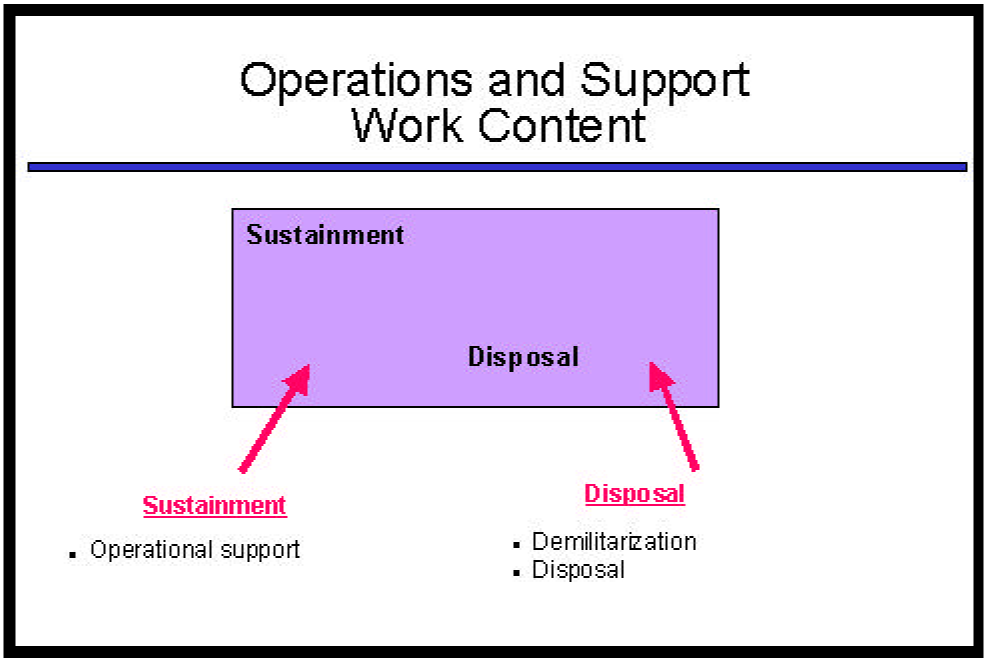

Figure 13. Operations and Support Work Content (From: Defense Acquisition Desk Book Site, DODI 5000.2 Operation of the Defense Acquisition System).

In the first part, the work effort is concentrated on operational support and in the latter; it focuses on disposal or demilitarization of the system. For the purposes of this thesis, the description of the 5000.2 model, which is the baseline for "traditional" acquisition, is complete.

C. CATEGORIES OF ACQUISITION POLICY

There are three different acquisition categories in the "traditional" process of acquisition as explained by the 5000 series documents. The process which each program follows depends on the specific acquisition category in which it is placed. The different acquisition categories in order from largest/most complex to smallest/simplest, are Acquisition Category I, (ACAT I), Acquisition Category II (ACAT II), and Acquisition Category III (ACAT III). Each

category has requirements, which the program office must meet and obtain approval for before they proceed to the next activity in the “traditional” process. In addition, all acquisition programs should have a MDA; of course, the rank and position of the MDA varies according to ACAT. Therefore, each program is mapped into one of three categories, where they follow similar regulations but at varying degrees of authority.

D. OBLIGATION AUTHORITY

Finally, the way in which obligation authority is allocated for each system development is directly linked to the “traditional” process of acquisition as described by the 5000 series publications. Right now the DoD uses a system called The Planning, Programming, and Budgeting System (PPBS), whose purpose “is to provide the optimal mix of forces, equipment, and support, which can be achieved within fiscal restraints.” (AFMC Financial Management Handbook, Updated December 2001) The PPBS is a plan for developing DoD’s budget request, which is sent to the president for approval and made a part of the President’s Budget that is sent to Congress. Within the PPBS:

> the odd-numbered calendar years are used to concentrate on the DoD planning process. During the even-numbered years, the Services formulate and submit their Program Objective Memorandum (POM) and BES (Budget Estimate Submissions) to the OSD (Office of the Secretary of Defense). The PPBS is a continuous process with PPBS activities from one year overlapping with PPBS activities applicable to other years. (AFMC Financial Management Handbook, Updated December 2001)

Congress knows how much obligation authority the program office desires for each system based on these submissions, and then later decides how much they are willing to appropriate for each program. Congress knows the desires of the program office since each service has stated the amount of obligation authority needed and its purpose in their POM and BES. This process is efficient for the phased process described by the 5000 series documents, but for Evolutionary Acquisition following a Spiral Development this would not be effective since Program Managers do not know the purpose of their obligation authority so far in advance.

This acquisition policy has been followed since before the Cold War. It is a phased process consisting of a series of phases and control gates, which control the development of a new program by balancing the risks, costs, and benefits of that system. This process also follows budgetary rules set up by the DOD’s PPBS. This acquisition policy, along with other budgetary and testing policies, are considered outdated processes which need to be changed so that changes in today’s technology can be more effectively tracked.

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IV. EVOLUTIONARY ACQUISITION FOLLOWING A SPIRAL DEVELOPMENT

A. THE SPIRAL PROCESS DEFINITION

The goal of this chapter is to provide the reader with a clear understanding of Evolutionary Acquisition following a Spiral Development.

As can be seen, the phased process described in the Department of Defense 5000.2 directive draws system development and acquisition out over a long period of time. Unfortunately, developments with this phased process might not be ready for use until several years later. This is disadvantageous to the United States especially when dealing with C4I systems since information technology is changing so rapidly. Therefore, the DoD acquisition policy needs to produce higher performance, with a more rapid deployment of the system. The acquisition policy that has been in use since before the Cold War needs to be changed. Some major goals of this new process would be to lessen the restrictiveness used in the policy by giving more flexible decision authority to the program manager. (Evolution of the DOD Acquisition Process: In a Nutshell)

Most of these changes were enacted on October 30, 2002, when Deputy Defense Secretary the Honorable Paul Wolfowitz signed guidance that gave relief from some of the current policies outlined in documents such as: DOD Directive 5000.1, "The Defense Acquisition System"; DOD Instruction 5000.2, "The Operation of the Defense Acquisition System"; and DOD 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs and Major

Automated Information System Acquisition Programs." Deputy Defense Secretary Wolfowitz wrote that "the intent of the guidance is to rapidly deliver affordable, sustainable capability to the warfighter that meets the warfighter's needs." (Plummer, 2002) The Honorable Mr. Wolfowitz continued to say that this new policy would hopefully create an environment in the acquisition community that would encourage “efficiency, flexibility, creativity and innovation.” The hope of this new directive was to give program offices the freedom to streamline their programs as they saw fit. Yet, he still hoped that they would develop systems whose standards were just as high. (Plummer, 2002)

The type of acquisition that the Honorable Mr. Wolfowitz promoted is Evolutionary Acquisition following a Spiral Development. According to the Department of Defense:

> Evolutionary acquisition is DoD’s preferred strategy for rapid acquisition of mature technology for the user. An evolutionary approach delivers capability in increments, recognizing, up front, the need for future capability improvements. The success of the strategy depends on the consistent and continuous definition of requirements and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability towards a materiel concept. (http://dod5000.dau.mil/Memo50002Oct30.doc)

Evolutionary Acquisition following a Spiral Development is completely different. It cannot be carried out following the “traditional” acquisition process as described by the 5000 series documents. It needs to follow a spiral process, a process where:

> …a desired capability is identified, but the end-state requirements are not known at program

initiation. Those requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user the best possible capability. The requirements for future increments depend on feedback from users and technology maturation. (http://dod5000.dau.mil/Memo50002Oct30.doc)

This Evolutionary Acquisition following a Spiral Development can be viewed below. The figure tries to depict that there is an initial desired capability but the end product is not known. It further emphasizes that at the end of each spiral user feedback is analyzed along with changes in technology to produce new requirements for the next spiral. This process happens faster than the “traditional” process as described by the 5000 series documents and produces a product to the fleet at the end of each spiral.

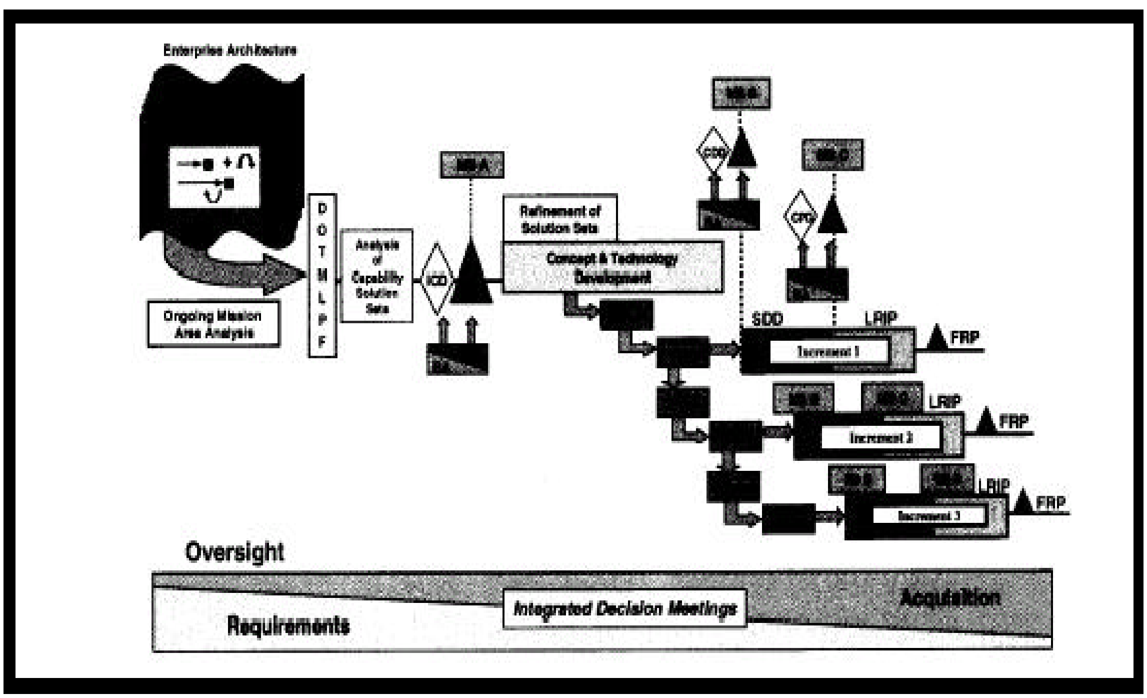

Figure 14. A Figure Depicting Evolutionary Acquisition following a Spiral Development (From: http://dod5000.dau.mil/Memo50002Oct30.doc).

B. EVOLUTIONARY ACQUISITION FOLLOWING A SPIRAL PROCESS

A literature search of articles and doctrine on Evolutionary Acquisition following a Spiral Development such as DoD doctrine from memos entitled *Operation of the Defense Acquisition System,* and articles by Dr. Stuart Starr, *The Requirements Process for the Acquisition of Command and Control Systems: Needs, shortfalls, and Challenges,* and the article, *Assessing Military Information Systems*, revealed COL Wayne M. Johnson, USAF (Ret) and Carl O. Johnson's breakdown of Evolutionary Acquisition following a Spiral Development in their article, *The Promise and Perils of Spiral Acquisition: A Practical Approach to Evolutionary Acquisition*, to be most helpful and accurate.

There are key facts of the Evolutionary Acquisition following a Spiral Development that a program office must know and consider before adopting it into their program. One must first realize that Evolutionary Acquisition following a Spiral Development will not work for all programs. In my opinion the "traditional" approach as described by the 5000 series documents would be better for larger/ more complex programs. There are specific characteristics, which Evolutionary Acquisition following a Spiral Development is appropriate. For example, Johnson and Johnson state:

> The intended spiral acquisition characteristics are large proportion of commercial technology or previously developed military technology; a desire to shorten technology insertion life cycles; schedule urgency; flexibility in requirements for later insertions and budgetary uncertainty. (Johnson and Johnson, Summer 2002, p. 177)

Also, unlike the phased approach explained earlier, the program office using Evolutionary Acquisition following a Spiral Development usually has an end goal but each spiral is not completely developed beforehand, and therefore, not preplanned until the next spiral. This means that the program office can only determine what needs to be accomplished in the next spiral by determining what was finished effectively in the current spiral. Thus, the main goal of the Evolutionary Acquisition following a Spiral Development is developing a series of smaller projects, which in turn, are returned to the user more rapidly.

Johnson and Johnson then break up the Evolutionary Acquisition following a Spiral Development into three main components, which can be summarized under the titles Requirements Definition, Acquisition Strategy, and Employment Concept. These three components help define what is needed for a spiral.

1. Requirements Definition

For the Requirements Definition component of this new approach, Johnson and Johnson state, “the user has to be involved up front and understand the desired end state solution will not come with the first delivery.” (Johnson and Johnson, Summer 2002, p. 178) Next, the program must have a way of doing business that includes the user in each

increment of the spiral. This means that the user must help determine at each spiral what the program needs and then there must be a process through which the program office and the user both decide on what is essential for the next spiral of the project. Thus, continuous communication, trust, teamwork and regularly held meetings are essential for obtaining the correct requirements and achieving success within each spiral. The system requirements are stated in a document that resembles an ORD from the "traditional" 5000 series approach, but it is called a Spiral Requirements Document (SRD) instead. This document lists the user's essential requirements for the system, but the users also have an understanding that the system might be less than perfect or 80% effective. The users "… will test it, field it, and use it knowing it does not meet all their needs, but it does have operational utility." (Johnson and Johnson, Summer 2002, p. 179) Therefore, there must be flexibility and balance between the users and the program office to establish the requirements. One can already see the three main differences between the 5000 series approach. "First, in a [Evolutionary Acquisition following a] Spiral [Development] …the program developer may make improvements that do not readily seem to support the end goal." (Johnson and Johnson, Summer 2002, p. 180, the words Evolutionary Acquisition following a and Development are not in the quote) Next, the Evolutionary Acquisition following a Spiral Development allows for the developer to more easily put leading edge software into the system. Lastly, in Evolutionary Acquisition following a

Spiral Development, at the end of each spiral, the item is not considered to be complete. Instead, another spiral will be used to produce an upgrade quickly.

2. Acquisition Strategy

Next, the program office must develop an Acquisition Strategy, which is a framework for translating the requirements into actions. For this strategy, the program office needs to develop constant communication and teamwork with the users, developers, Spiral Development Integrated Product Teams, and the Program Office. This includes scheduled meetings of a Spiral Development Integrated Product Team. This team will help the program office provide insight to the user.

Flexibility like in the phased approach is also important in the Acquisition Strategy. First, the program manager must look for long-term flexibility in the project, and must realize that appropriations from Congress can change, and therefore, must be willing to accept budget cuts. A solution for budget cuts for Evolutionary Acquisition following a Spiral Development that cannot be done in the phased approach would be to move a requirement from one spiral to the next. Another difference between the phased approach and Evolutionary Acquisition following a Spiral Development is that flexibility in testing must also exist. "The testing community cannot become rigidly fixed on an end requirement or a [Evolutionary Acquisition following a] Spiral Development will not work." (Johnson and Johnson, Summer 2002, p. 181, the words Evolutionary Acquisition following a are not in the quote) Therefore, testing procedures need to be assessed so that user is

still getting a safe product but with the understanding that more testing is needed before there will be an end result. In Evolutionary Acquisition following a Spiral Development, one must also learn how to manage risk by not allowing the burden of success to be based on too much technology or capability in one spiral at a time. Therefore, Johnson and Johnson recommend breaking up the development into smaller compartments. In other words, “keep the critical path simple and singular.” (Johnson and Johnson, Summer 2002, p. 181)

3. Employment Concept

The Employment Concept component of Evolutionary Acquisition following a Spiral Development can be a little more challenging than the approach described by the 5000 series documents, but the output is produced more quickly. In this part of Evolutionary Acquisition following a Spiral Development, the user must work directly with the program office and testers to determine “...the priority list of capabilities they would like to see fielded. This gives the program office a means to make focused decisions.” (Johnson and Johnson, Summer 2002, p. 183) This is more challenging in Evolutionary Acquisition following a Spiral Development because the Program office is continuously getting new user requirements and then making sure that the testers and engineers know and agree with these requirements. The challenge is that these requirements are constantly changing as opposed to the phased approach were once the requirements are composed they do not usually change as rapidly.

The logistics team during Evolutionary Acquisition following a Spiral Development must be very skilled because there are usually multiple configurations of the system fielded at the same time. The multiple configurations of the system are disadvantageous, but this happens today with the 5000 series approach due to unplanned occurrences, and in the spiral approach, the program office is doing upfront planning for this logistics challenge by realizing that with each spiral there is a different system produced. Therefore, logistics representatives early on are prepared for different configurations of the same development making it easier for maintenance and training.

In conclusion, there are many advantages to Evolutionary Acquisition following a Spiral Development and some disadvantages. Some advantages over the traditional form of acquisition are that capabilities are delivered quicker to the warfighter, the program office can manage risk more efficiently, Evolutionary Acquisition following a Spiral Development is more receptive to user needs, and technology changes can be applied to the system more easily. Some aspects to be cautious of when using Evolutionary Acquisition following a Spiral Development for their program are: Evolutionary Acquisition following a Spiral Development could be looked at as an easy budget cut by Congress due to its flexibility between spirals, test teams must realize that partial capability must be looked at initially, logistics teams must be willing to support multiple configurations that are fielded, the user must understand that they are not going to get their final product in the first spiral but probably an 80% effective system, and they must understand that their program will be

subject to false comparison. “… The question will be, ‘Why fund the new system that does not greatly perform over the older system?’” (Johnson and Johnson, Summer 2002, p. 186) Even with these drawbacks to Evolutionary Acquisition following a Spiral Development, the benefits in the long run are significant for many programs.

Evolutionary Acquisition following a Spiral Development is the acquisition policy of the future for most systems. It has many advantages and some disadvantages. Overall there must be a strong relationship with users, contractors, the program officer, and testers for this Evolutionary Acquisition following a Spiral Development to work.

V. THE TES-N ACQUISITION PROCESS

This chapter further explains why the United States needs to change its acquisition policy in order to provide timely technology and intelligence to the warfighter. Next, it explains the JFN/TES-N Evolutionary Acquisition following a Spiral Development process. This chapter then uses the breakdown of Evolutionary Acquisition following a Spiral Development in the Johnson and Johnson article as a model for Evolutionary Acquisition following a Spiral Development and the DoD 5000 series documents as a model for the “traditional” acquisition policy. These models are then compared to reveal key points that highlight relative differences between the two, and these differences serve as a basis for characterizing the JFN/TES-N acquisition process.

A. TIMELY INTELLIGENCE AND SUCCESS IN WARFARE

History has shown that timely intelligence can lead to improved battlefield performance. In June 1941, in the Battle of Midway, the United States defeated the Japanese in a battle that demonstrated how timely intelligence provided to the warfighter could change the outcome of a battle. ADM Yamamoto Isoroku’s command had major advantages in force structure, technology, training, experience, morale, and inertia. Yet ADM Chester W. Nimitz, whose only advantage was in timely intelligence, was victorious over the Japanese. (Blackledge, 2002, pp. 3-4)

The United States Navy learned from engagements like the Battle of Midway that timely intelligence was necessary for success in the past. Now we are engaged in a new type of warfare —War on Terrorism— where timely intelligence is even more important. Fortunately, at the same time that the War on Terrorism began, the Navy was in the process of fielding a new system, TES-N, which provided a great capability for gathering and disseminating this intelligence. However, the only way to rapidly deploy this system to support the war on terrorism was through an Evolutionary Acquisition following a Spiral Development

B. THE STEPS THAT LED TO TES-N DEVELOPMENT

On September 11, 2001, hijackers of two commercial planes crashed them into the twin towers of the World Trade Center in New York City, killing all passengers and large numbers on the ground. Later a third commercial plane was crashed into the Pentagon, causing hundreds of deaths and turmoil in our country's center of military leadership. The next crash of a passenger plane by terrorists occurred in Pittsburgh, killing everyone onboard. (http://abcnews.go.com/sections/us/DailyNews/WTC_MAIN010911.html) Due to these attacks, Congress turned to the military to provide better intelligence for the United States. The Navy responded that they were working on the development of JFN/TES-N, and Congress then urgently funded development of the TES-N for rapid deployment. According to CAPT Albert Thomas from NAVSEA IWS 6C:

> After 9/11, Navy received emergency supplemental funding (DERF) to rapidly deploy NFN capability in the form of TES-N installations and JSIPS-N, GCCS-M, and communications upgrades. In parallel with executing these wartime operational

> deployments, the NFN Program office is developing plans to continue spiral development and acquisition of … the TES-N. (NFN Read Ahead for N76)

Therefore, the Navy adopted an acquisition policy for the TES-N, which is known as *Evolutionary Acquisition following a Spiral Development*.

C. THE TES-N EVOLUTIONARY ACQUISITION SPIRAL DEVELOPMENT PROCESS

The TES-N was developed due to an urgent and strong need by the Navy for the intelligence capabilities (described above) which the TES-N could provide to the warfighter. Therefore, the normal way of starting an acquisition, with a MNS and an ORD, was not followed. Instead, there was direct approval from a Vice Admiral to start development of the TES-N (due partially to the fact that the Army had already developed their own TES). (Thomas, Interview, 2002)

Initially the Army had developed the TES-A with Evolutionary Acquisition following a Spiral Development, so the Navy joined the Army Evolutionary Acquisition following a Spiral Development of TES, which led to the Joint Commonality Board being formed. In order to fully understand the notion of Evolutionary Acquisition following a Spiral Development that the TES took, one must understand what the JCB is and what its roles are for the TES system. As discussed in Chapter II, the JCB was formed earlier by the Army to help organize the development of the TES throughout all of the services. More specifically, the JCB has a role of forming and maintaining the Integrated Product Team (IPT) for the TES system development. Each IPT

is co–managed by the government and a contractor, and each IPT has a chief engineer that it must answer to about its part of the system. There are teams for functions such as security, SIGINT, fielding, and many more. Figure 3 shows how the TES IPTs are structured. Each IPT has representatives from each service to make sure that their service's needs are being met with each spiral of the TES.

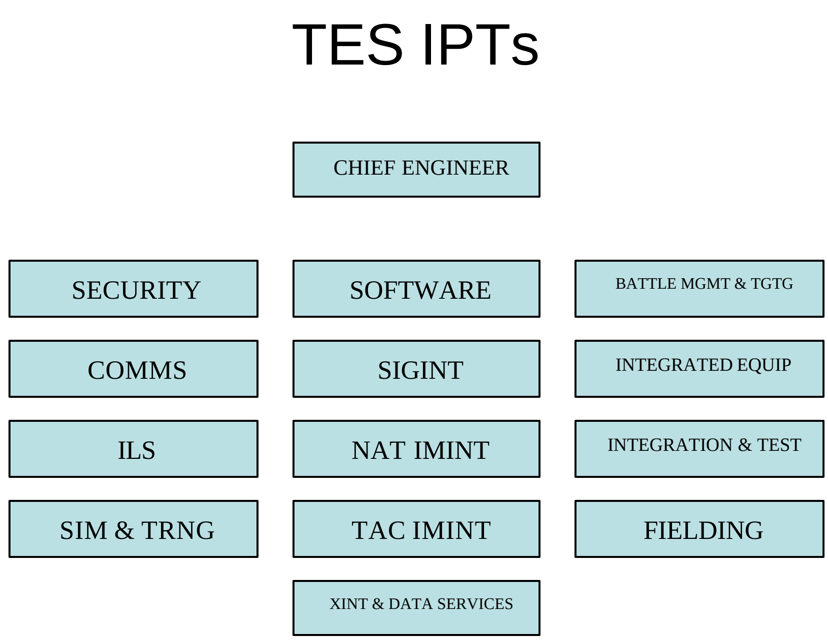

Figure 15. Shows the Different IPTs in the TES-N Program (From: Lajoie, PowerPoint Slides, 2003).

This procedure provides checks and balances to assure that each service's user needs are being met. (Lajoie, Interview, 2003).

The TES-N Evolutionary Acquisition following a Spiral Development process was done in an 80/20-Spiral Development schedule. The figure below represents the 80/20-Spiral Development process.

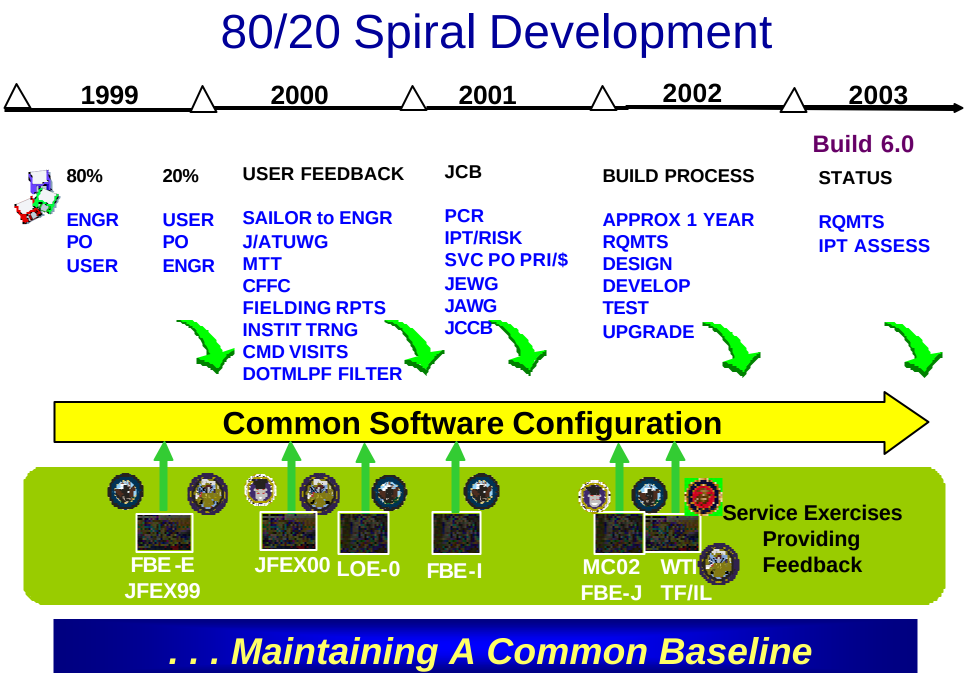

Figure 16. This Figure Depicts the 80/20 Relationship of the TES-N Evolutionary Acquisition Following a Spiral Development Process. Entities Listed are Stakeholders for Each Process in the 80/20 Relationship. (From: Lajoie, PowerPoint Slides, 2003).

The 80/20-Spiral Development means that in the beginning of a spiral or for the first 80% of the spiral the decision making is done with the engineers having a lead role about the development or systems engineering part of the process, with the users in more of a reactor mode and the program office staying in the control mode. In the last 20 % of the spiral the user has more to say and acts in a more leading role, while the engineers act in more of the reactor mode, and the program office still behaves in the control mode. With this 80/20 relationship in mind, the Evolutionary Acquisition following a Spiral Development goes through a series of steps, which happen in parallel throughout the process. These steps are known as USER

FEEDBACK, JCB, BUILD PROCESS, and STATUS. In the USER FEEDBACK step, the program office and engineers receive feedback from users and actions such as the fleet, Mobile training Teams (MTT), command visits, CFFC testing, the DOTMLPF filter, and institutional training. Next the JCB looks at the user requirements and decides which user requirements will be changed in the next spiral of the system (the Navy representative on the JCB serves as an advocate for fleet requirements). They evaluate such things as risk, funding allotted, and recommendations from different (IPT). Once a list has been made, the BUILD PROCESS step lasts a maximum of one year. In this step engineers design, develop, test, and upgrade the new TES (and therefore TES-N) system. In the last activity, STATUS, the program offices and IPT analyze what requirements were met and then distribute the new system. The process then starts all over again with the user assessing the new system and coming up with feedback to improve it. With each new run through these four activities, a new spiral is formed in the development of the TES (and therefore the TES-N).

More specifically, the TES-N program office built the basic system with a test software version 1.0 in early 1999. They never fielded version 1.0, but with their in-house testing of it came up with a list of deficiencies. They quickly corrected these deficiencies and within the same year developed and fielded version 2.0. The next figure gives an idea of what new software was developed in each TES-N spiral.

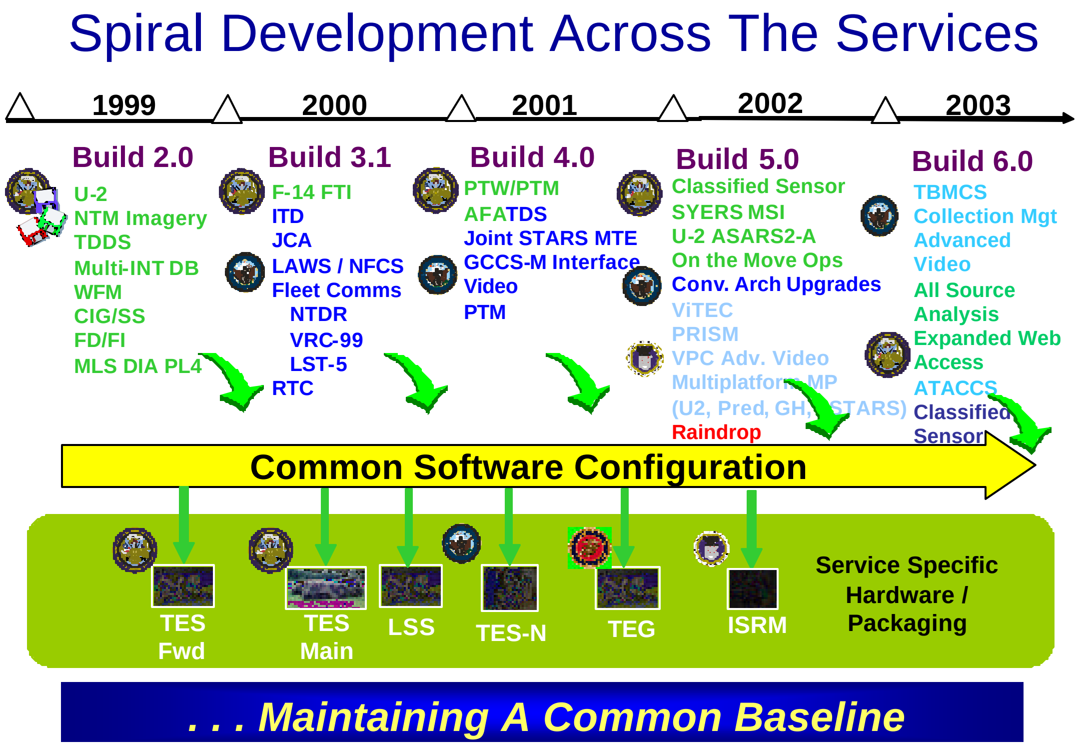

Figure 17. This Figure Shows What Changes Were Added to the Software in Each Spiral of the TES-N (From: Lajoie, PowerPoint Slides, 2003).

D. WHERE THE TES-N PROGRAM IS CURRENTLY AND WHAT IS THE FUTURE OF THE PROGRAM

1. Current

Since the TES-N followed an Evolutionary Acquisition following a Spiral Development form of acquisition, the system currently has no Acquisition Category or Navy MDA, per se. The NFN (now known as JFN) MNS which was signed on 13 Feb 02 recommended an ACAT III designation, but that has not been officially adopted. But, the TES-N does get a great deal of oversight from many masters, to include PEO IWS, all three SYSCOMS (but primarily NAVSEA), the Virtual Program Office, and the OPNAV staff. (Burns, 2003) Below is a more complete list of TES-N stakeholders:

- PEO IWS - JFN
- PEO LSC - DDX
- PEO SHIPS - CVN 77 DEVELOPMENT
- PEO SUBMARINES – FLORIDA, SSGN
- NIMA - IMAGERY OVERSIGHT
- AGENCY - CLASSIFIED
- JCS - TES-J
- MDA - PROJECT K/DSP
- JTAMDO - SWA OPERATIONS/ATTACK OPS
- ESC, HANSCOM - ISRM
- NAVAL RESERVES - LSS
- MARCORSYSCOM – TEG, RTC
- ASPO - TES
- APL - JTAAC
- PEO IEW&S - DCGS ARMY
- MOBSTR - PROGRAM OFFICE
- ETP - PROGRAM OFFICE
- DARPA - MTES/AMSTE II/SIAP
- JFCOM - JACKNIFE ACTD
- ONR - X, KU BAND PHASED ARRAY ANTENNA DEVELOPMENT
- SAP - PROGRAM OFFICE
- NAVAIR – HARRY BUFFALO, EA-6B, JSOW (AMSTE II)
- AFRL - TUT
- FUTURE: COAST GUARD - DEEP WATER (Burns, 2003)

Next, another important document which is called the TES ORD by the TES-N program office is currently the original Army ORD used with the TES-A system. Unfortunately, there is still not an approved TES-N ORD,

but on the other hand, there is now a renewed move to produce a JFN ORD, which has been in development (and has fallen in and out of favor) since last summer. (Burns, 2003) As for the TES-N position in the Evolutionary Acquisition following a Spiral Development process, it currently has a fielded, tested, and trained software version 5.0.5. The program office has recently been working on Build 5.2, which is essentially a "patch" that provides the capability to test and demonstrate SHARP tactical Imagery capability in TES-N. Build 5.2 is only being deployed to Fallon for testing. The next Version, 6.0, is in the development/testing stage of the spiral development process and will be delivered this fall. Build 5.2 capability will be incorporated into the 6.0 software. (Burns, 2003)

2. Future

The JFN/TES-N will continue to be updated with new software, and the Honorable Mr. Young's recent guidance states that the Navy will converge its JFN architecture onto a TES-N baseline. How that convergence will take shape is still to be determined, but one can possibly foresee ideas such as JSIPS-N capabilities like Precision Targeting Workstation (PTW) and JSIPS-N Concentrator Architecture (JCA) being integrated into TES-N. (Burns, 2003)

E. EVOLUTIONARY ACQUISITION FOLLOWING A SPIRAL DEVELOPMENT OR A TAILORED "TRADITIONAL" PROCESS (SIMILARITIES AND DIFFERENCES)

The JFN/TES-N program used Evolutionary Acquisition following a Spiral Development as described by Johnson and Johnson and a little of the "traditional" policy described

in the 5000 series publications. In this thesis I have used the Johnson and Johnson model for Evolutionary Acquisition following a Spiral Development and the 5000 series documents to describe the “traditional” process to emphasize key points such as the Requirements Definition, Acquisition Strategy, and test and evaluation procedure that highlight relative differences between the two as a basis for characterizing the TES-N acquisition process.

The first key point was that the JFN/TES-N program was developed with urgency, and from a previously developed military technology. These two characteristics immediately provide a fitting reason, as according to Chapter IV, to consider executing Evolutionary Acquisition following a Spiral Development. Additionally, in the TES-N program, the Program Manager CAPT Albert Thomas, continuously gathers feedback about user needs from operators and decision makers using TES-N. But, the TES-N program office did not initially produce a MNS or ORD to get approved for development of their system. (Thomas, Interview, 2003)

In comparing this to the Johnson and Johnson model, some of this activity occurs in what these authors call the Requirements Definition phase of a program. During, this activity the user is involved up front and needs to be continuously consulted for each spiral of the development. Next in the Requirements Definition phase, the program office must establish a SRD, but this did not happen in the TES-N program. The user’s essential requirements for the system are listed in the SRD, but the user also understands that the system will be less than 80% effective. The TES-N program did not have an SRD, but consulted an old ORD from

the Army TES-A program. They also, later in the program development, produced a MNS that was similar to the "traditional" approach outlined in the 5000 series documents, but was not written in the order that the "traditional" approach follows. Below is an example of an objective from the MNS of the JFN/TES-N program. It states:

> Objectives. To generate targets by collecting and collating detection data gleaned from a variety of dispersed sensors and sources including sub-surface, surface, air-breather or space-based, fusing and transmitting that data to cognizant commanders for threat evaluation, and engagement platforms for weapons assignment in support of the Joint Force Commander's objectives. This MNS documents the need to convey relevant information required by the warfighter throughout the "Detect-Control-Engage" sequence. (Mission Need Statement For Naval Fires Network (NFN) ACAT III, p. 2)

This MNS does reflect the 5000 series publications but it was not done in the same sequence as the 5000 series documents. This MNS statement was produced after development and fielding of the system had taken place, not before the system was approved for Concept Exploration.

Next, the program office had an Acquisition Strategy for putting the requirements into action. In the TES-N program, this was done through the JCB and the TES IPT. The JCB and TES IPT provided constant communication for the project. In visiting the program office, CAPT Thomas seemed busy, continuously finding new user requirements and then vetting out which ones could be solved and which ones would be held to the next spiral. This gave me the idea that he understood that his program never had an end capability and that it would always be changing to take advantage of

changing technology. According to Johnson and Johnson, in the Acquisition Strategy for Evolutionary Acquisition following a Spiral Development, the Program Manager constantly looks for new user requirements for the next spiral and they understand that there is flexibility in their program, meaning there is no need to be rigidly fixed on the end product. This was similar to what happened with the TES-N program.

Next, the testing community in an Evolutionary Acquisition following a Spiral Development also cannot be fixed on the end capability. The TES-N program did not follow the "traditional" test and evaluation phase, due to the fact that they had no ORD to be tested, and they still wanted a fast development of the capability. (Lajoie, Interview, 2003) Instead, testing was done in events such as LOE and FBE. For example, a TES-N prototype was successfully demonstrated in Fleet Battle Experiment-India (FBE-I), an exercise event involving all four services conducted in June 2001. Based upon this successful demonstration, COMTHIRDFLT recommended immediate deployment of JFN aboard USS JOHN C. STENNIS (CVN 74) and USS ABRAHAM LINCOLN (CVN 72), with COMNAVAIRPAC citing JFN as a "critical capability." (Burns, 2003) CNO (N7) recommended immediate acquisition and deployment of JFN/Time Critical Strike capability. In July 2001, the Assistant Secretary of the Navy (Research, Development and Acquisition) (ASN RDA) designated a Naval Fires Network/Time Critical Strike Program Director to integrate and synchronize acquisition and deployment activities across the Navy's Systems

Commands. Currently there is no efficient testing procedure on Evolutionary Acquisition following a Spiral Development, but doctrine is being developed. (Burns, 2003)

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VI. CONCLUSIONS

This chapter provides conclusions and recommendations on what can be improved and what should be used in future acquisition programs such as the TES-N.

Evolutionary Acquisition following a Spiral Development shown with the TES-N system is an acquisition policy of the future. This thesis shows that Evolutionary Acquisition following a Spiral Development with the JFN/TES-N system is an acquisition policy that is appropriate for programs of the same size and scope, but larger more complex programs will not have as much success. This Evolutionary Acquisition following a Spiral Development for small/low complexity programs provides faster implementation of the system, involves the user throughout the process, and allows each service to be up to date with the changing effects of technology. Yet, despite all these benefits, there is still some work that must go into other policies that affect Evolutionary Acquisition following a Spiral Development. After a more in-depth look into the TES-N program, one can see that future programs following this type of acquisition policy will have issues with areas such as budgetary submission, the role of OPTEVFOR in their programs, policy, process, and training.

A. OPINIONS AND BENEFITS

In interviewing many officers, I found that varying opinions have been formed regarding JFN/TES-N in the Navy. According to CAPT Paul Hill, SPAWAR 05 Deputy for JFN, the JFN/TES-N, system–of-systems, has shown that Evolutionary Acquisition following a Spiral Development will provide

tremendous improvements in technological capabilities and attributes, but it has also proved that it is way ahead of its CONOPS. (Hill, 2003) This means that the technology is updated effectively but the support, logistics, and training policies cannot keep up with these new capabilities. Listed below are attributes and capabilities of TES-N received from the Program Office. Next, CAPT Christopher Bott, Commander Third Fleet, J2, stated that the JFN/TES-N concept of a single box capability, which allows access in real time, is a good one. He further states TES-N is nearly ready but still is lagging with inter-system problems between TES-N and GCCS-M; in addition, the graphics could be improved. (Bott, 2003) Furthermore, CDR Olivarez, a strike Commander aboard the USS CORONADO, he commented that when he was aboard the USS LINCOLN, he found that not many operators knew how to use the TES-N. In addition, operators and aviators needed to understand each other's requirements for TES-N. (Olivarez, 2003)

B. LIST OF CAPABILITIES AND ATTRIBUTES THAT JFN/TES-N PROVIDED

- Attributes:
    - Competitive award
    - 100% Government owned
    - Non-proprietary
    - Spiral development
    - Configuration managed by a 4 Service JCCB
    - Common software baseline
    - Over 65% of content by other contractors
    - Common workstations for all Services

- Multi-INT architecture:
  - Sensor access, control and management
  - Situational awareness
  - Mission planning and monitoring
  - Exploitation
  - Communications and dissemination
- Software Architecture:
  - Open and Non-proprietary
  - ICDs and APIs documented but controlled by Government
  - Commercial standards compliant
  - Over 115 COTS/GOTS products integrated
  - IP based internal and external network interfaces
- Scalable:
  - Hosted on a variety of platforms across all Services; Vannized, shipboard, rack mounted, transit case, and airborne
  - Software is issued in a configuration-managed version across all Services.
  - Major upgrade typically once per year, minor upgrades as needed.
  - Service may chose not to purchase a particular COTS license (capability not fielded).
- Jointness:
  - Over 40 systems fielded and operating world-wide
  - OIF supported by a TES variant from each Service
  - Supports National thru Unit level
  - Sharing, files, data, Intel daily

- Footprint TES supports other disadvantaged nodes
- Army: TES Forward, TES Main, DTES
- Navy: TES-N, RTC, RTC Lite
- USMC: TEG, RTC
- Air Force: ISR-M Host, ISR-M Remote (Burns, 2003)

Even with these impressive capabilities, the JFN/TES-N acquisition still encountered issues in other policies that needed to be addressed. This includes policies in budgetary submissions, test and evaluation, general policy and process in the Navy, and training.

C. DRAWBACKS: FUNDING, TEST AND EVALUATION, POLICY, PROCESS, AND TRAINING

The TES-N, due to its acquisition policy of Evolutionary Acquisition following a Spiral Development, did not use traditional methods in funding, test and evaluation, policy, process and training. In order to avoid similar problems in Evolutionary Acquisition following a Spiral Development for future programs following this new acquisition policy, there must be new procedures for test and evaluation, budgetary submissions, policy, process, and training in the Navy.

1. Funding

a. Problem

Traditionally, as according to the 5000 series documents and as described in Chapter III, funding is conducted according to the Planning, Programming, and Budgeting System (PPBS). The TES-N program could only partially follow the guidelines of the PPBS because they used the Army’s funding documents of the TES-A program. The

TES-N program office can realistically provide an estimate of how much money they intend to spend over the next several years and what they intend to use it for, but in reality, due to the Evolutionary Acquisition following a Spiral Development, the program office only knows how much funding they will need in the future once the users' feedback is obtained. User feedback is only received after the new development is brought into the fleet; therefore the time constraints for Evolutionary Acquisition following a Spiral Development do not allow for a funding policy that acts in accordance with the PPBS. Moreover, other programs like the TES-N might not have prior programs to base funding on for the PPBS. In conclusion, since each spiral depends on the previous spiral there is no way a program manager can produce a Program Objectives Memorandum (POM) for years in the future. (Lajoie and Thomas Interviews, 2003)

b. Solution

In my opinion there is not yet a clear and definite answer to this problem. A recommendation based upon research for this thesis would be that Program Managers of Evolutionary Acquisition following a Spiral Development need to work on explaining and teaching to the budgetary submission analysts how Evolutionary Acquisition following a Spiral Development works and that funding requirements are obtained only once user feedback is received. The Program Managers need to do this until the budgetary submission analysts buy into the unique funding developments of Evolutionary Acquisition following a Spiral Development.

2. Test and Evaluation

a. Problem

For each new development of a system, there must be some sort of test and evaluation to determine if the system is ready for delivery to the fleet. In the 5000 series documents, and as explained in Chapter III, the testing role is lead by OPTEVFOR. This process is usually a very long and detailed process. Since the TES-N was developed in Evolutionary Acquisition following a Spiral Development for quick fleet operational capability, it bypassed the OPTEVFOR stage and went directly to the certification stage for implementation into the fleet. Later in the TES-N development program, Commander Fleet Forces Command (CFFC) requested OPTEVFOR to test TES-N, but OPTEVFOR was not sure what or how to test since there was no new ORD produced and the Army ORD had already been tested. In conclusion, this part of the TES-N acquisition needs to be revised for future systems so OPTEVFOR can clarify and then fulfill its role in testing a program that has Evolutionary Acquisition following a Spiral Development. (Lajoie, Interview, 2003)

b. Solution

According to a contractor for JFN’s resource sponsor, N61, David Loneman, one cannot do away with Test and Evaluation (T&E) and the role of the testers (OPTEVFOR) but the internal organization needs to be changed. If you did away with T&E the fleet would not feel comfortable using the product developed. A solution to this might be

hiring more people so the process of test and evaluation is faster to keep up with technology but still is as efficient. (Loneman, 2003)

Due to the changing policies in acquisition, I believe the role of OPTEVFOR and documentation on parameters for testing should be changed, too. For example with the JFN/TES-N, the Evolutionary Acquisition following a Spiral Development was done in an 80/20-Spiral Development schedule. Usually OPTEVFOR tests compliance with the ORD but in Evolutionary Acquisition following a Spiral Development no ORD requirements will be initially produced. In my opinion with this 80/20 relationship in mind, OPTEVFOR should be provided different levels of ORD requirements to review. This would include initial testing, midterm testing and then a final testing when each requirement is met (the final testing might not come for many spirals so they would have to be patient). So initially we would have more of a 70/20/10 relationship (Engineers, Users, OPTEVFOR). OPTEVFOR needs to be involved early in the project to make sure the project is safe, while at the same time not delaying the program for fleet use. Then at midterm a 60/20/20 relationship (Engineers, Users, OPTEVFOR) should be used in Evolutionary Acquisition following a Spiral Development. Finally when capability is complete then it would become a 40/40/20 relationship. This means OPTEVFOR is always in on the workings of the program and does not have to wait to the end to test. According to VADM (RET) Ted Parker, this kind of arrangement for OPTEVFOR I suggested above can work, and has worked in the past. He also commented on other suggestions such as:

> Getting OPTEVFOR OTDs involved very early is healthy for any program and especially important if one is not quite sure what the route is to the final set of requirements. If this is done, the OTDs gain better understanding of what the developmental item really is, and can apply better judgment to issues that arise. In my experience, this permits a. much more opportunity for DT&E to produce data that is useful to Operational Evaluation of the system. Sometimes, it just requires a simple change (that can be suggested by the OTD) to make a test that has no operational content into one that has enough operational content that the results can be applied toward IOT&E. b. utilization of more DT&E data and better understanding of the system. This will usually avoid the problem of dumb tests being conducted and paid for (saves money and time). c. better thinking by the PM, because he/she will have an opportunity to understand the needs of the OTD and can get ready for them (do better in OT&E). (Parker, 2003)

In conclusion, OPTEVFOR and program offices that use Evolutionary Acquisition following a Spiral Development need to work together to make a test and evaluation policy that will be efficient with this new form of acquisition.

3. Policy and Process

a. Policy

(1) Problem. Some policies of the Navy need to be changed. Policy was done differently for the JFN/ TES-N form of acquisition. For example, there was constant leadership throughout this program. The Navy made a decision to leave the Program Manager, CAPT Thomas, in the same position since 1996. In acquisition programs such as Evolutionary Acquisition following a Spiral Development it is critical to have the same leadership since it takes a long time to understand issues and make changes to the

program. If they had reassigned him the program would have eventually collapsed or fell behind. (Thomas, Interview, 2003)

(2) Solution. According to CAPT Thomas, the Program Manager for the JFN/TES-N, the Department of the Navy should change their officer career path for acquisition. For example, the pipeline would continue as normal until X.O. level. At X.O. level, the board would screen officers for acquisition billets. Then, if awarded acquisition billets those officers would spend the next 15 years, plus, in acquisition. They would first act as Deputy Program Managers so that they would get initial understanding of the job. According to CAPT Thomas, it takes time to understand the Program Manager concepts. Next, the Navy would promote a percentage of the Deputy Program Managers to Program Managers. As Program Managers, they would stay on that specific program until the project was complete or they were deemed incompetent. Also, by not moving them until the project was finished, it would let the Program Manager’s workers know that he/she was not going anywhere, which would curtail “slow rolling” to wait for change of leadership. (Thomas, Interview, 2003)

Within this new policy, one needs to ensure integrity in the system being worked on. An answer to this would be to give a bonus to keep the Program Managers from retiring and working for the contractor when they retire. Next, there needs to be a structure to account for human nature. Most people in the acquisition business seem to be very ambitious, aggressive, and very competent. But, when there are large sums of money involved, people can be

corrupted. Therefore everyone involved in the project needs to have a personal interest to be successful. (Thomas, Interview, 2003)

b. Process

(1) Problem. This program also reveals a struggle that the Navy has in its process and a problem that might hold back future progress in fielding technological support to this program. This problem builds back up for user buy ins and training. For example, since Evolutionary Acquisition following a Spiral Development has been adopted it has created tension between three different groups of people: OPTEVFOR and the developers, the operators of the TES-N and the idea of having new system ownership, and tensions between the different mentalities of the Pacific and Atlantic Fleets. In LCDR Matt Hopson's opinion, the J2 Systems officer on USS CORONADO, the capabilities of TES-N are there but there is a lack of teamwork and proficiency throughout the project. For example, OPTEVFOR needs to work with the developers, and the developers need to work with OPTEVFOR to find a way to efficiently test the Evolutionary Acquisition following a Spiral Development process without taking four years, and still keeping in mind that the capability is not yet finished. The Navy also needs to challenge its operators to take ownership of the new system and work with each other to make sure it is producing the correct display of data. Finally, there needs to be an alliance between the Pacific and Atlantic Fleets to install this system in both fleets at the same time. This system is supposed to provide interoperability between all the services, but the Pacific Fleet is the only one using it in the Navy. Thus, the Navy

has moved away from this stovepipe philosophy with Evolutionary Acquisition following a Spiral Development and it needs to do this also with its processing procedures. (Hopson, 2003)

(2) Solution. One possible solution according to Destiny Burns from the program office, involves creating greater fleet ownership of the system through an institution of combined formal schoolhouses, on-site training, and more "train-the-trainer" type of activities, establishment of formal TES-N/JFN billets and transition of logistics activities from the contractor to the fleet. (Burns, 2003) An example of a near term plan related to these tasks is that during Fiscal Year 2003, the JFN Program Office established a customer support strategy to engage Fleet users in the assessment/development of a Performance Based Logistics (PBL) strategy in accordance with ASN (RDA) Memorandum PBL Guidance Document of 27 Jan 2003. Interim Defense Acquisition Guidebook of 30 Oct 2002 states that Program Managers shall establish logistics support concepts and refine concepts throughout program development. JFN shall coordinate program requirements for support across functional areas to minimize redundant contract deliverables and inconsistencies. A JFN Product Support Plan is being developed for all fielded JFN systems. The Product Support Plan includes methods and tools to track system performance, such as designation of a JFN System Officer associated with each fielded system, to enhance coordination and implementation of formal and informal reporting and feedback procedures such as:

- Sailor-to-Engineer Website Access
- Navy Integrated Call Center
- Remedy Database (Burns, 2003)

Another key JFN Integrated Logistics Support (ILS) strategy is the transition of depot support, sparing, and maintenance support from contractor to government (fleet) control and responsibility. (Burns, 2003)

4. Training

a. Problem

As everyone knows, technology can not be used if no one knows how to use it. The TES-N training system has caused a delay in the use of TES-N operationally. Currently, the normal training schedule is constant training on the system for ten days (65 hours). TES-N is not typically used right away, so when the operators are about to use it they are given a quick refresher course. Therefore, there is a huge gap between training and system use, which causes proficiency to go drastically down. (Hopson, 2003) This will be viewed from the results of a survey I conducted on 06MAY03 and 07MAY03 given to the operators and decision makers of the JFN/TES-N aboard the USS CORONADO.

Table 1 presents results of a survey used to rate the effectiveness of the JFN/TES-N training. It displays the mean score and range from lowest to highest for each question, using a seven-point scale. Participants were asked to rate the number on the seven–point scale with which they best agreed. The seven-point scale ranged from 1= Not at all Effective or Extremely Difficult (depends on

the question) to 7 = Extremely Effective or Extremely Easy (depends on the question). Below is an example of the scales used in the survey.

1	2	3	4	5	6	7
Not Very Effective	**Somewhat Extremely**		**Moderately Effective**		**Very Effective**	**Extremely Effective**

1	2	3	4	5	6	7
Extremely Difficult	**Very Difficult**		**Moderately Difficult/Easy**		**Very Easy**	**Extremely Easy**

The survey was administered to 11 operators and decision makers of the JFN/TES-N; 11 completed surveys were returned and analyzed.

	Survey Question	**Mean**	**Range**
1.	How effective was the training to operate TES-N?	4	(2-5)
2.	How easy was it to learn to use the TES-N?	3.6	(2-6)
3.	How effective was the actual process that was used (meaning combining all intelligence people to work together) to implement the new TES-N?	4.7	(2-6)

Table 1. Results of Survey on Effectiveness of JFN/TES-N Training.

The question that asked about the **effectiveness of the TES-N training** received a mean rating of 4, indicating that it was moderately effective. Two participants stated that the trainers/contractors were better suited for tech support than operator training. They explained that lots of training time was wasted due to the trainer’s lack of operator experience with the machine.

Another participant stated that they had received only on-the-job training, which was helpful, but without formal training and constant use the training was not effective. Also an operator explained that the training was good but the UNIX environment that JFN/TES-N operated in was non-familiar and slowed the learning curve for many operators.

The next question asked about **how complicated the TES-N was to learn.** The mean rating for this item was 3.6, indicating that it was more than moderately difficult. One participant stated that a reason TES-N was difficult to learn was because there were so many parts to JFN/TES-N and many operators and decision makers did not practice using them everyday. Another operator commented that it needed to be more user-friendly since the system step/functions were not intuitive and there were too many steps involved in completing one task. In contrast, another operator commented that it seemed fairly user-friendly, especially if you have a motivated instructor and get hands-on training, then anyone should be able to learn the system.

The next question asked about the effectiveness of the actual process **that was used (meaning combining all intelligence people to work together) to implement the new TES-N.** The mean rating for this question was 4.7, which indicates that is was greater than moderately effective. One operator rated this item as a 5 since the proximity of all the intelligence sources and adaptation to the type of intelligence flow allowed more timely fusion of intelligence. Another operator agreed and said the process

was effective last summer for the Millennium Challenge Exercise. Another operator commented that better training would help the process run even smoother.

With these survey questions analyzed I conclude that training of the TES-N needs to be improved. It seems that most operators and decision makers get on the job training and not formal training of the JFN/TES-N. If formal training is given then it is limited. Furthermore, hands-on experience with the system is not occurring after training is completed, therefore knowledge is lost. Furthermore most Navy personnel have been trained on Windows and not UNIX, which causes problems since the operating system of TES-N is UNIX. In addition, the training system also could be easier to utilize, meaning there are too many steps to complete a task. Finally, the TES-N process of combining all intelligence people to work together seems to work but would run smoother with more formal training and better doctrine.

b. Solution

A solution to the training dilemma might be to follow what the Army initially did. The Army did their initial training a different way. They formed a TES organization before they started the development of the TES-A. This organization included experienced operators who were hand picked. (Thomas, Interview, 2003) This integration went a lot smoother. Next, the Navy could have sent more people to the Army training center to get more formal training instead of on-the-job training for the JFN/TES-N. Finally, there should be a human factors training person involved in the initial spiral development

of the system so they can help ensure a good Human System Interface and document how to operate the new system as it is being developed.

This thesis concludes that Evolutionary Acquisition following a Spiral Development shown with the JFN/TES-N system is an acquisition policy that is appropriate for programs of the same size and scope, but larger more complex programs will not have as much success. Yet, in order for the JFN/TES-N program and future programs using Evolutionary Acquisition following a Spiral Development to succeed changes have to be made in policies such as budgetary submissions, test and evaluation, policy, process, and training.

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